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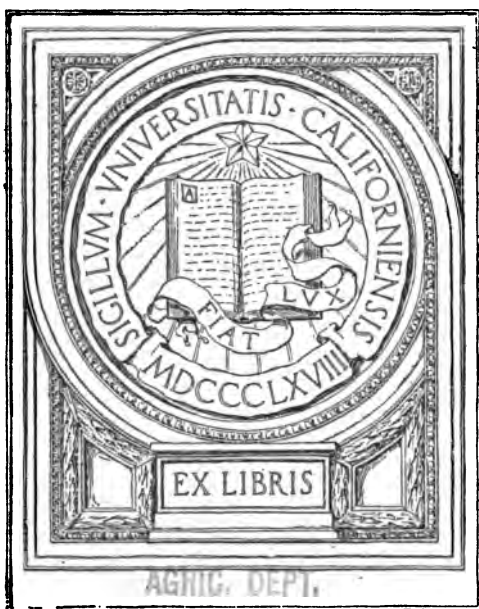


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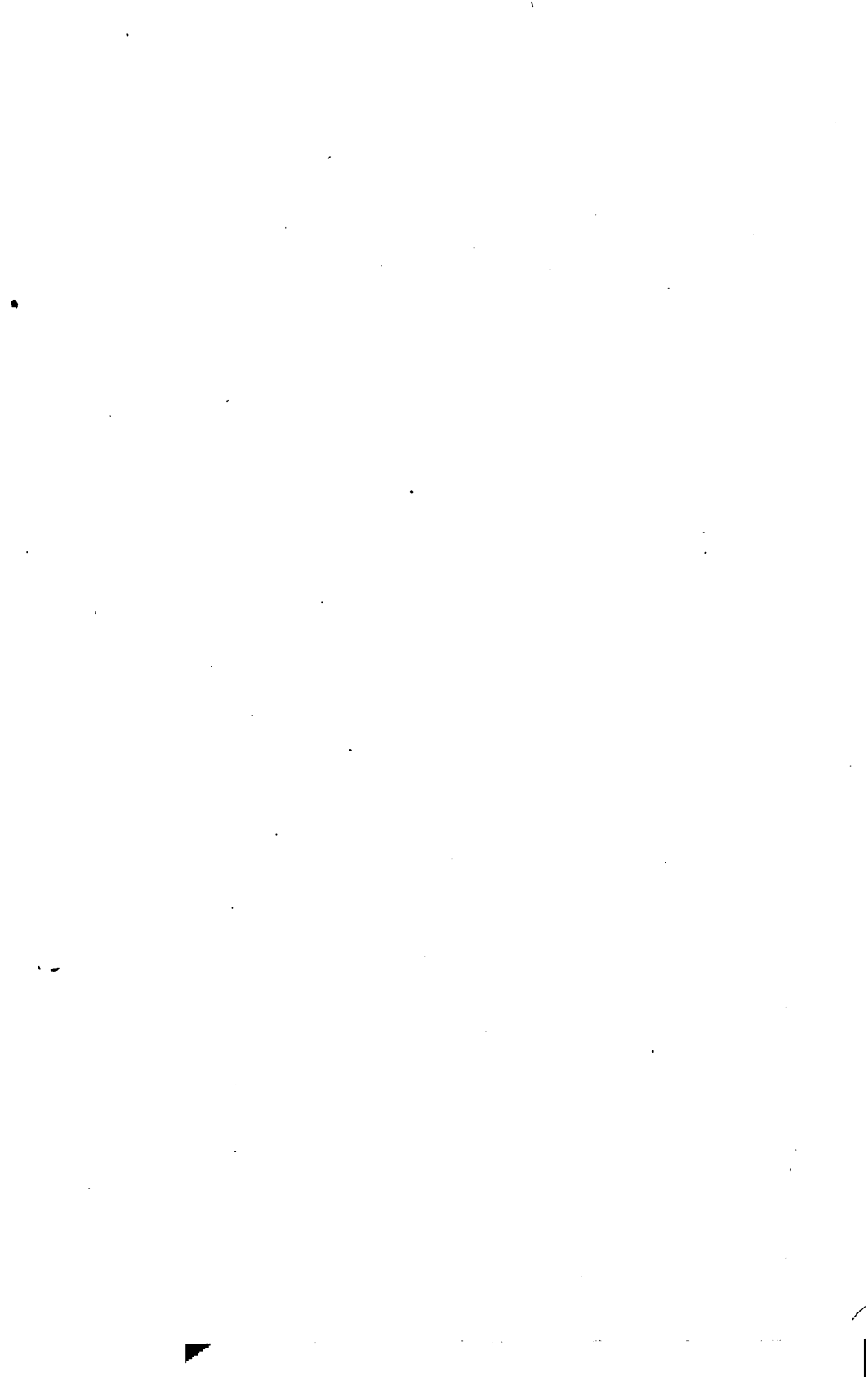
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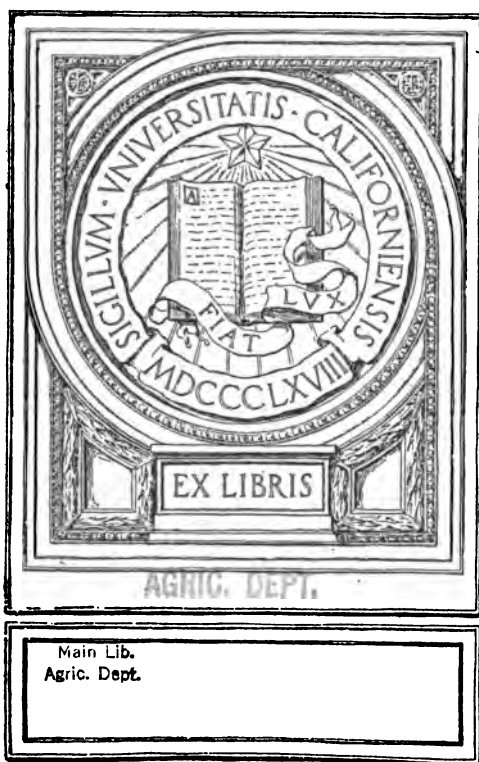
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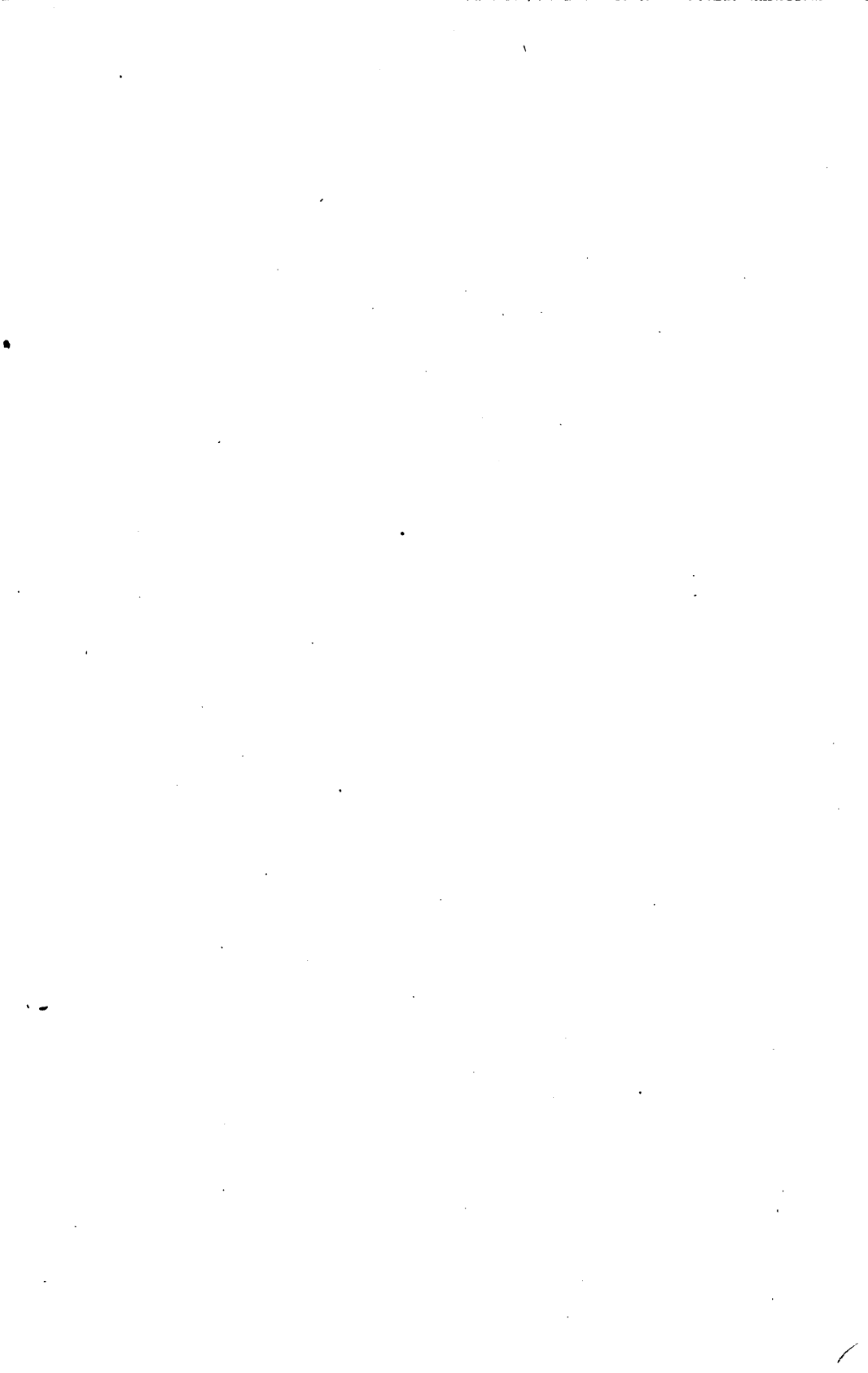


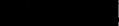


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"ALFALFA"

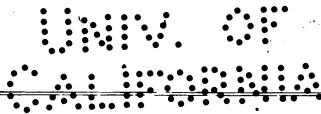
A HANDBOOK FOR THE ALFALFA- GROWER AND STUDENT

BY

L. F. GRABER

ASSISTANT PROFESSOR OF AGRONOMY
UNIVERSITY OF WISCONSIN

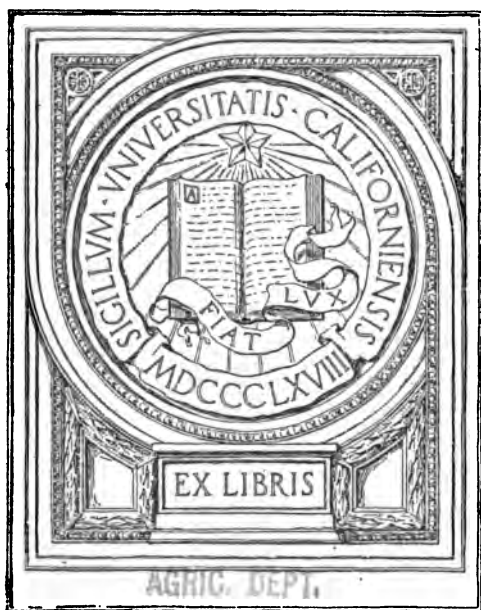
SECRETARY OF WISCONSIN ALFALFA ORDER



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and I've bought two carloads since then. Every new piece of alfalfa I put in is inoculated and limed. That's the secret of the whole proposition. But I have had my troubles too. Last winter I lost ten acres. I cut it late in October and the patch killed out. The fields that I cut early in September came through fine. And believe me, you can't pasture it either if you want to keep a good stand."

"But isn't it true that even with the best of care alfalfa winter-kills?" asked a very much interested one of the group.



Fig. 1. Equipped to grow his own feed with alfalfa for hay and corn for the silo.

"Yes, it does. When we get an open winter with little snow and then lots of alternate freezing and thawing and formation of smothering ice-sheets, alfalfa—especially on flat land—will kill out. That's what happened in many places last year. But clover goes, too, so I guess we have got to look at it as a weather proposition just as we would a hailstorm or a drought. We can't control the weather. But they say there are some kinds of alfalfa that don't winterkill. We'll hear about them later." (See Figs. 50 and 51.)

An elderly man with a long gray beard leaned over the edge of his seat. His voice was rather husky, but he had a clear, intelligent eye and a face that bespoke toil and success.

"I have been listening to this discussion and I suppose if we keep on there'll be no need of going to the meeting," he said. "We'll have it all threshed out beforehand. But I'm interested. I've turned the farm over to the boy. He's been introducun' a lot of ideas and practices that we never thought of years ago. At first I was a little scared the boy was going wild. But now I'm satisfied to let him go ahead.

Lime Pays

"When the boy bought his first carload of lime and then went to all the extra trouble of inoculating and getting a good seed bed and

paying four to five dollars an acre for alfalfa seed, I figured he'd have to get some alfalfa yields to make it pay. But it's paid well. Alfalfa costs extra, but pays double extra. And do you know that after a field has once grown alfalfa it is much less expensive to get a stand than it is with a new field that has never grown it before?

"As my son argued with me when he first started out, 'If my alfalfa will last me for three years or five years the first cost of getting a stand does not amount to much when distributed over this period of years. With corn you have the expense of plowing and planting every year.'

The Hustler's Hay

"If you want to know what our greatest trouble with alfalfa is I'll say it's labor. When I grew a mixture of timothy and clover I cut it once for hay and in some years I got a crop of clover seed. But alfalfa gives you three jobs of haying every year. It's no lazy man's crop. You've got to be a hustler, like the plant itself.

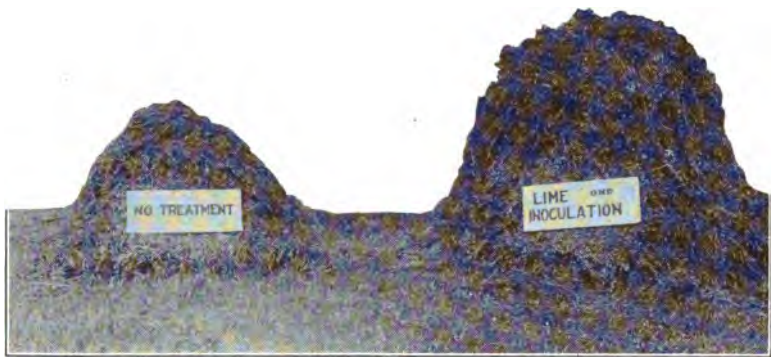


Fig. 2. Proper soil treatment may double the yields.

"The boy now has fifty acres and he has his hands full. But he's a good manager and he keeps those barns full, too, and full of the finest hay in the world."

The elderly man grew enthusiastic; that he was proud of his son was very evident.

"Oh, yes, we have our alfalfa troubles. Two years ago we lost our first cutting on twenty acres. It rained so much that it just rotted. But the boy doesn't worry about curing alfalfa. It's no harder than curing clover, and alfalfa hay will stand more rain than either clover or timothy. If he loses the first crop he has two additional crops to bank on. And then he always hires extra help. It pays him. Look at the extra feed he gets.

"I know alfalfa doubles up the farm work round corn-cultivating time. It takes extra help, but the extra profits will take care of that.

Blue-Grass Troubles

"Many of the farmers in our section complain about blue-grass' crowding out alfalfa. But I've noticed that it's always those fellows who cut their alfalfa late in the fall or pasture it who complain the most. They expect too much from their alfalfa when they take a cutting in October or pasture in the fall. That causes winterkilling.

Then the blue grass naturally takes the place of the dead alfalfa plants and makes a very prominent appearance at the time of the first cutting. It then gets the blame for the thinned stand of alfalfa, though the condition was entirely due to winterkilling by the late fall cutting or pasturing. Of course, after the June grass has gained a good foothold it will then gradually crowd out the alfalfa, but most of this blue-grass trouble is due to late cutting or pasturing or real hard winter weather. (See Figs. 14 and 37.)

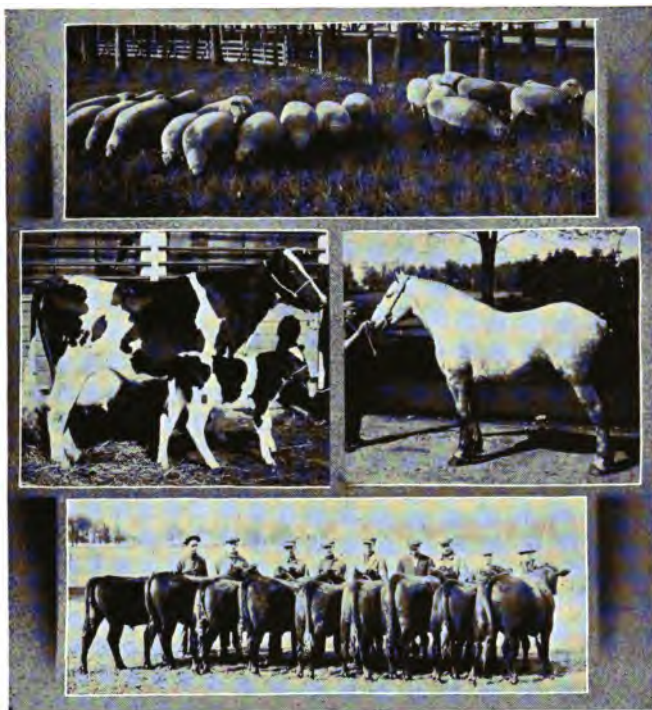


Fig. 3. Alfalfa excels as feed for all kinds of livestock.

Alfalfa—In the Rotation

"Do you know what my boy is planning on doing now? Well, sir, he is going to put alfalfa into a regular rotation just as I used to handle clover. He has grown alfalfa on that farm until now it's just as easy for him to get a stand of alfalfa as of timothy and clover. He plans to plow his third crop every two years in a rotation of two years of corn, and then seed down to alfalfa for two years, using barley as a nurse crop. I guess this is alright, but it's one of these new ideas that are hard for fellows like me to see. I'd rather have an alfalfa field stand as long as it would produce satisfactory crops. But everybody to his own judgment on this proposition. One thing, it's quite a job to plow up an old alfalfa field. (See Fig. 13.)

Don't Be Prejudiced

"Did you ever hear Joe Wing talk alfalfa? He used to say it

took three things to plow an alfalfa field—a good sharp plow, a strong team and a Christian man.” The old man chuckled. “I guess he was right too. Oh, I tell you, gentlemen, alfalfa like any other crop has its good points and its bad points. It’s for the beginner to weigh the evidence on both sides as applied to his farm conditions. Perhaps his land is too flat and sour for alfalfa, or the necessary lime is too costly to haul and apply, or he may have a hard-pan sub-soil and poor drainage. (See Fig. 40.)

“In all events we should be open-minded on alfalfa—not like some who will stare a beautiful alfalfa field square in the face and still say ‘It ain’t adapted round here.’ Nor should we be like some



Fig. 4. Cornalfalfa Farms, Waukesha, Wisconsin
grow over 200 acres of alfalfa.

of these city farmers who hear all about the great merits of the crop and want to put their whole farm into alfalfa. One is just as bad as the other.

“We have got to be fair about it both in boosting and in knocking it. It has its objections and its big advantages. It’s going to come, gentlemen, but that’s up to you. Down in my own section not more than ten years ago everybody was talking against silos. There were all kinds of stories going round about silage eating out the cows’ insides and making their teeth fall out and their ribs cave in. In spite of this the silo has come. I look on alfalfa the same way. It’s going to come, boys.”

At this moment the train arrived. I met the group of men on the platform.

“Gentlemen,” said I, “you have covered this alfalfa proposition so well in your discussion that I’ll know exactly what to say this afternoon. Do you know that there are only 980 acres of alfalfa in this entire county against 70,000 acres of timothy? I don’t believe it will hurt some of us to get inoculated a bit. That’s what I am here for.”

Arguments For and Against Alfalfa

GEORGE FITCH once wrote that "alfalfa is the greatest known breakfast food for cattle . . . and possesses a flavor that makes the most blase cow brighten up and pass her plate for more." George Fitch has not been the only one to proclaim the merits of alfalfa. Bankers, lawyers, doctors, merchants, manufacturers, authors, professors, governors, agriculturists, and some farmers, have climbed on the band wagon to join the chorus of praises of alfalfa.

If it is worthy of all this approbation it is fair to ask why it is not more generally grown on livestock farms, especially in the Middle-Western and Eastern States. If its popularity is just a fad, what justification is there for all the numerous alfalfa campaigns, tours, demonstrations, associations, and never-ending alfalfa articles in the agricultural press? That there are two sides to alfalfa is indisputable. It has its enthusiastic friends and enemies. In many places it is like a prophet in his own country, without honor. In other places it is the leader among forage crops.

Alfalfa—Our Best Hay Crop

All the good things about alfalfa may well be summed up as follows: Where it can be grown successfully it excels all other hay crops in yield per acre, feeding value, drought resistance, soil enrichment and weed eradication. This covers the field of alfalfa enthusiasm. I have elaborated on these very points at farmers' meetings.

Not long ago I was asked to say a good word for alfalfa at a large farmers' picnic in Illinois. They listened to me; they even applauded very energetically after I was through. But after the meeting a half dozen farmers gathered round and said:

Objections

"We have grown alfalfa. It may be all you say in some places, but not so on our farms. Our soil isn't right for it. It costs us too much to get it started, and then it doesn't last. It winter-kills and blue-grass and weeds come in. It brings too much work. Help is scarce. It would keep us haying all summer, leaving no time to cultivate the corn or potatoes, particularly in June when they need it most badly. It doesn't fit into a short rotation, as clover does, and it is mighty hard plowing alfalfa stubble. There are so many failures in growing alfalfa round here, and so much time, effort and money have been wasted in trying to get alfalfa started, that we believe we would be better off to let it alone and stick to our old friend clover."

That is the other side of alfalfa. What some people think is conservatism on the part of farmers may often be good common sense. Is it good common sense to get into the alfalfa business? We shall see.

Crops That Work Hardest for Us

This is a day and age of upward-soaring prices for land and labor. It is becoming necessary for livestock farmers to grow chiefly those crops that work hardest for them—those crops that produce the most and bring the greatest net returns for the labor and effort applied. In the Corn Belt and the Eastern States there are two crops which stand foremost in the production of feed per acre for livestock—corn and alfalfa: corn for silage; alfalfa for hay. They are two crops which, if grown successfully, make a combination on any farm that for feed production, milk production, or meat production cannot be beaten.

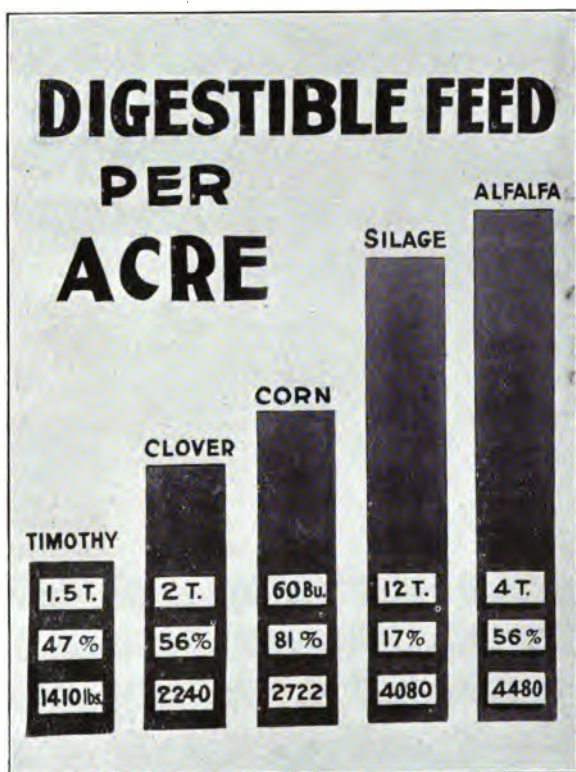


Fig. 5. Timothy, Our Poorest Feed Producing Crop.

Upper figures are average yields. Where they do not apply substitute yields obtainable under your conditions. Central figures give per cent digestibility and lower figures, the total digestible nutrients per acre.

The yields of almost any crop for livestock are best figured in terms of the quality of feed and total yield of digestible nutrients per acre. An acre of alfalfa is capable of producing three times as much actual feed as an average acre of timothy.

Timothy—the Poorest Feed Producer

Yes, I know that those of us who are timothy growers have argu-

ments in defense of this much-abused crop. We say it is easy to get a catch of timothy; that it seldom winter-kills; that it lasts for several years; that the hay is easy to cut and cure; that the harvest of timothy for hay or seed comes at a time when it does not compete seriously with other farm work.

But in the final analysis it still remains that timothy produces the least amount of feed and the poorest quality of feed for cattle when compared with clover or alfalfa. Can we afford at this critical period to expend our valuable time—our high-priced labor on a crop that produces so little—that gives such minor returns as does

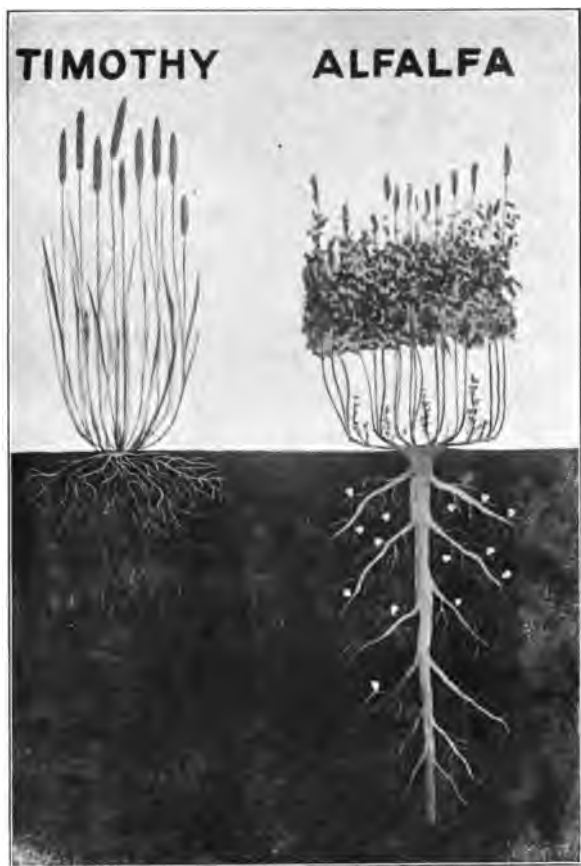


Fig. 6. Alfalfa vs. Timothy.

This illustration shows (1) the deeper and far superior root feeding system of alfalfa (2) the nitrogen supplying nodule growths on alfalfa roots (3) the length of the new stem sprouts growing at the base of the plant, when alfalfa is in full bloom and past the proper cutting stage.

timothy? Of course there are conditions where timothy is more advantageous than alfalfa but on the \$200 lands of our livestock farmers it will continue and must continue to give way in importance

and area to those much superior feed-producing crops, alfalfa, clover and corn.

Roots That Resist Drought

Lecturers on alfalfa spend half their time on alfalfa roots, which seem to grow deeper and deeper. Some enthusiasts are not satisfied until they have them reaching clear through to China and involving us in international difficulties! Of course, this could occur only with very old fields!



Fig. 7. Alfalfa Enriches the Soil.

Tall corn, average growth on alfalfa sod. Short corn, average growth on timothy sod. Both the timothy and alfalfa sods of this field were three years old, plowed and planted to corn at the same time and in the same way.

Photo taken in July.

But the feeding system of the alfalfa plant is wonderful. Why is it that alfalfa grows so fast—often an inch a day? Why is it that alfalfa produces three crops a season and in the long-seasoned climate of the Southwest five or six crops?

It is because the plant is equipped with a root system equaled by no other crop. I have seen plants in an alfalfa field in its second year with roots that averaged four feet long. Plants in same field when three years old had a root growth of more than seven feet. It is claimed that out West roots have attained depths of more than fifty feet, but the subsoil was loose.

With such an equipment, one can readily understand why alfalfa resists drought and heat; that when the corn is stunted and the pastures are parched and brown, about the only crop that maintains its vivid green to brighten the landscape and cheer the farmer is alfalfa.

Soil Builders

These roots not only give alfalfa a strong constitution and great growing power, but they leave a permanent and lasting benefit to the farmer in the way of a more fertile soil. When an alfalfa field is plowed the roots themselves decay and make the best kind of humus-building manure. (See Fig. 13.)

There is another way and a more important manner in which alfalfa builds up the soil and makes it richer and more productive—that is through its nitrogen-gathering bacteria. Go into a successful alfalfa field in June and dig up some plants. Carefully break away the soil from the finer roots and observe on them the small swellings or nodules. We all know, or should know, that these



Fig. 8 This was a "One Time" Fertile Soil.
What timothy growing and soil robbing will finally lead to.

nodules are the homes of millions of bacteria that use up the nitrogen gas of the air and convert it into a liquid form of nitrogen which is an actual fertilizer for the plant. (See Fig. 28.)

Alfalfa—A Soil Fertilizer Factory

An alfalfa field is a marvelous fertilizer factory, each acre capable of manufacturing annually 160 pounds of raw nitrogen into an available form of plant food. Alfalfa supplies its own nitrogen requirements. When the manure from alfalfa hay is returned to the soil that produced it vast stores of nitrogen accumulate and result in bigger and better crops of corn, potatoes or tobacco, which may follow after the alfalfa field has been plowed. Clover is also a valuable soil enricher, but it does not add so much nitrogen or so much humus-forming material in the way of root growth and stubble as alfalfa.

Destroys Canada Thistles

Canada thistles have long been a dreaded enemy of the farmer in the Middle West. In fact, they are so persistent in their perennial growth that many fields are rendered unprofitable because of the abundance of this weed.

One way to get rid of them is to wage a bitter and unrelenting warfare against them with the plow and spring-tooth harrow for one entire summer. Like any warfare, this is costly. Not only does it require much labor, but the use of the field is lost for one year.

Let Alfalfa Fight for You

Why not let alfalfa do the fighting for you? Alfalfa is a peace-loving plant, but it is the best weed scrapper of all the forage crops that are grown on the average farm. Just give it a good supply of ammunition in the form of lime, inoculation, drainage and a carefully prepared seed bed, and it will wipe out the worst army of Canada thistles that has ever taken possession of a field.

A few years ago the Cornfalfa Farms, in Waukesha County, Wisconsin, had a fifteen-acre field of oats. Canada thistles were so thick that it was useless to harvest the grain. It was cut with a mower and burned.

The field was plowed twice that fall and again the following spring to keep the thistles under control. The soil was limed, inoculated and disked several times. Early in July alfalfa was seeded at the rate of twenty-five pounds to the acre. That fall there was a good growth of both alfalfa and weeds.

The first cutting was made early in June of the next year. The alfalfa was far ahead, but the thistles were quite abundant. The second crop had less of the thistles and the third crop still less. The alfalfa outgrew its competitor. I was on this fifteen-acre field the third year after it had been seeded, and the only thistles we could find were in a few patches round the edge of the field and on one or two low spots where the alfalfa had killed out.

A Weed Fighter

Our common weeds—in fact, practically all weeds except quack grass—are held in subjugation by alfalfa. Its growth is so dense, so rapid and so overmastering that with the frequent cuttings the weeds have little opportunity to establish themselves.

This is a benefit that cannot be ascribed to any other hay crop. It is true that a timothy sod or a good stand of clover will in a measure subdue weeds, but neither crop can be compared with alfalfa for effectual weed eradication. Clover does not last long enough, and timothy does not grow fast enough.

No Criticisms on Alfalfa for Feed

The most pessimistic critic has faith in alfalfa hay as a feed for cattle, hogs and sheep. There are no complaints in regard to its feeding value. It has a unanimous vote of approval. It is high in protein—that valuable and high-priced constituent of any feed-stuff, which builds up the lean-meat tissues, the bones, and the cheese-producing part of the milk.

The Wisconsin Experiment Station finds that one acre of alfalfa will produce as much protein as three acres of clover or nine acres of timothy. Alfalfa is a concentrated hay feed—equal to bran for dairy cows. It takes the place of costly feed products. It means home-grown protein. It reduces the feed bill. It is relished by all farm animals.

Not Always the Best

What more could one expect of any farm crop? And yet there are good, practical, money-making farmers who pay no attention to the popular slogan, "Alfalfa on every farm." Not on every farm can alfalfa be successfully grown. When I say successfully grown I mean profitably grown, because you can grow alfalfa anywhere in the United States if you have enough money to make conditions right for it.

But take, for example, the northern parts of Wisconsin, Minnesota and Michigan, where much of the land is newly cleared and



Fig. 9. "Lest We Forget"

Our Old Friend Red Clover

Where clover grows like a weed and alfalfa is difficult and costly to establish, it should not be too strongly emphasized.

nearly all of it grows clover like a weed, though much of it is too acid to grow alfalfa readily. That alfalfa can be grown there by the use of lime has been demonstrated by the presence of many excellent fields, but with clover so abundant, so luxuriant and so certain and easily established, without the trouble and cost of liming or inoculating, do you blame the farmer for being conservative in his views on alfalfa? Do you blame him for being slow to take a chance on a new crop that is exacting in all its requirements, especially for lime and inoculation and a carefully prepared seed bed?

Where Clover May be Better than Alfalfa

Furthermore, clover seeds abundantly in the North and, with the second crop for seed, the farmer has an important source of cash income from his clover field. Alfalfa does not produce successful yields of seed in the humid areas. In general, alfalfa-seed production is profitable only in the more arid sections of the West. So where clover grows abundantly, and bounteous yields of both hay and seed are easily and cheaply obtained, alfalfa should not be too much emphasized, especially if its establishment is difficult, costly and uncertain.

Where Alfalfa Beats Clover

In many of the older sections of the Middle West and in the Eastern States, clover production has become a problem. It does not grow

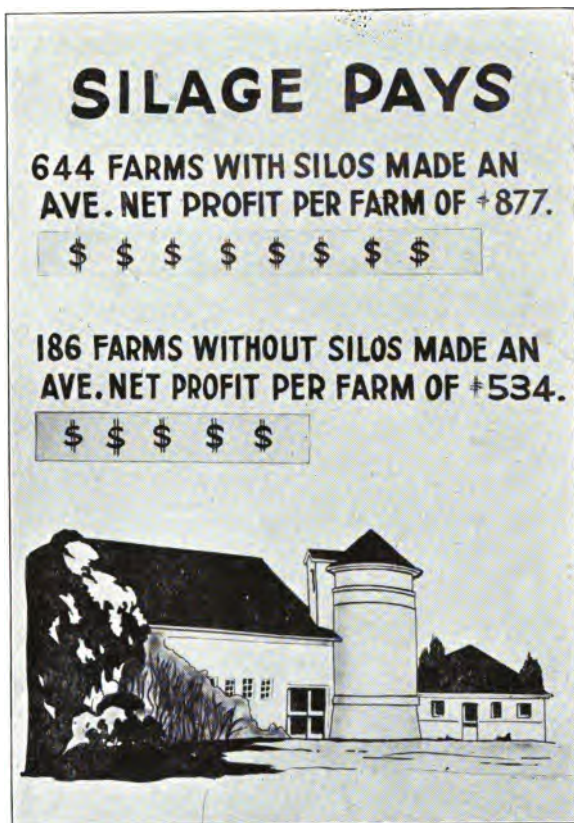


Fig. 10. Silos Save Feed and Money Too.

Wisconsin has over 60,000 and is building more and more every year.

as it did years ago when the land was new. It is hard to get a stand. Some say the soil is "clover sick," which may mean almost anything, but nearly always does mean a lack of lime.

When liming is necessary for clover, alfalfa may prove to be the more profitable crop, for with lime alfalfa is generally no more diffi-

cult to establish than clover and the yields of actual feed to the acre are far superior. I do not wish to discredit the value of clover. It will always have a place on our livestock farms because it fits so well in our short rotations, but its prominence as a general forage crop is giving way to alfalfa, especially where clover fails to give the returns and yields it did years ago.

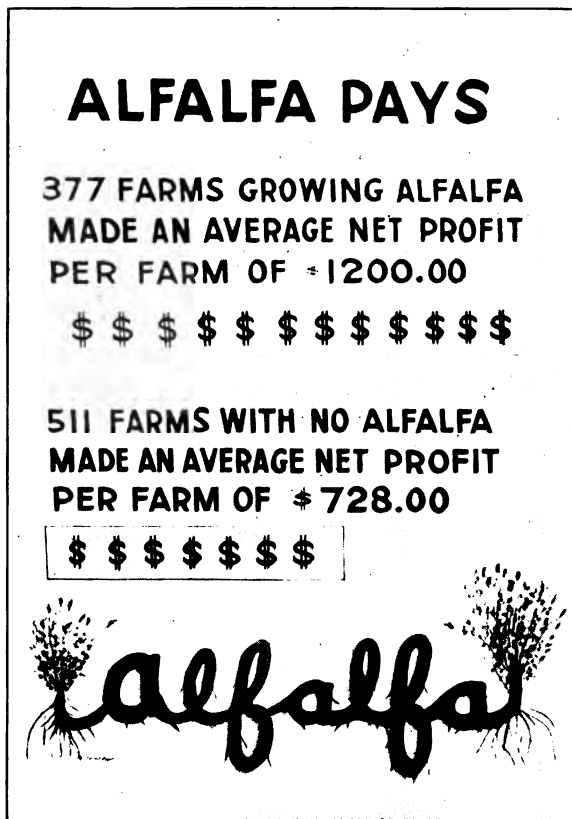


Fig. 11. Average results obtained on 888 Wisconsin farms where farm accounts are kept.

We Need More Alfalfa

Government statistics, (1910,) illustrate the possibilities of extending the alfalfa acreage of the East and the Middle West. According to their figures the New England States were growing 500 times as many acres of pure timothy as of alfalfa; New York, Pennsylvania and New Jersey had fifty times as much timothy as alfalfa; the North Central States sixty-eight times as much acreage of timothy as of alfalfa.

Alfalfa Prejudice

It would seem that there is still much room for more alfalfa in spite of all the good work that has been done.



Fig. 12. Live Stock and Legumes, the Basis of Permanent Agriculture.
Grow more alfalfa to keep more and better live stock.



**Fig. 13. Plowing under the third crop of alfalfa for corn is
a revolution to the soil.**



Fig. 14. Late Fall Cutting Weakens Alfalfa.

The vigor and rapidity of spring growth is seriously impaired following late fall cutting or pasturing.

Sample 1. Cut September 2, 1914. Height May 12, 1915, 22 inches.

Sample 2. Cut September 26, 1914. Height May 12, 1915, 17 inches.

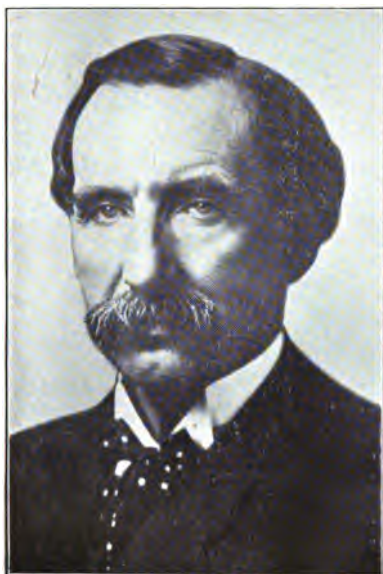


Fig. 15. This beautiful sheaf of alfalfa was awarded a gold medal at Panama Pacific International Exposition. Grown and exhibited by Swartz Bros., Cornalfalfa Farms, Waukesha, Wisconsin.

From numerous experiences, I am convinced that one of the greatest barriers to the onward progress of alfalfa in those sections where more alfalfa could be profitably grown is the unfavorable sentiment developed by failures. There are many such examples in our Middle Western and Eastern States. I have observed several of them and it always is the same old story:

"It isn't adapted round here. Sam So-and-So tried ten acres of it and he got only seven loads off his whole patch."

Sam's failure might be very easily explained and the remedy given, but it makes no difference—Sam's failure is the principle topic of alfalfa conversation. It has molded the sentiment of that community in regard to alfalfa and will retard the general growth of the crop in that section for years.



Ex. Gov. W. D. Hoard



Prof. R. A. Moore

Fig. 16. Pioneers, Who Made Alfalfa, A Wisconsin Crop.

These men blazed the trail and made the way for the
"Queen of Forage Plants" in Wisconsin.

Demonstrations, institutes, agricultural schools, and state alfalfa-growers' organizations must break down prejudice where prejudice is not founded upon solid facts.

Every state has its alfalfa problems, but everywhere these problems are being solved. In some sections alfalfa may not be profitable, but in most places it would be a big paying crop if alfalfa growing was understood as well as corn growing or timothy growing. Too often alfalfa is a neglected crop because of a lack of confidence necessary to seed it right and to use the extra effort and money necessary to get a good stand the first time.

What Alfalfa Needs Most—Lime

Use Lime on Sour Soils to Prevent Failure

WHEN a man fails with alfalfa it is but natural for him to relieve himself of all blame. It is human nature for him to say: "Alfalfa is not adapted round here. It doesn't catch. It doesn't produce. Lots of money is wasted on alfalfa. It has failed with me and I am through with it for good."

Yet for every alfalfa failure there is a reason. Depend upon it, if you fail to give alfalfa a square deal it will balk. If you don't know what alfalfa requires for a square deal you would better not try to grow it until you have found out. If it costs too much to give alfalfa a square deal, and if it does not repay you for your effort, leave it out of your crop schedule.



Fig. 17. Mr. Jas. B. Cheesman.
First President of the Alfalfa Order.

True, there is lots of money wasted on alfalfa. It is the easiest thing in the world to have an alfalfa failure. It is being done every year, and thousands of dollars are thrown away annually in trying to grow alfalfa. Who is to blame? Is it the alfalfa or is it the man?

See that your Soil Conditions are Right

Alfalfa growing is like most ventures: It is the man behind the gun who hits the mark—not the gun alone. And if you don't believe in inoculation; if you don't believe in testing your soil for sour-

ness and using lime if the soil is acid; if you don't see the importance of having a well-drained, sloping field, don't attempt to grow alfalfa. You will have better luck with timothy—at least you will waste less and probably will make more money with timothy.

Good seed, lime, inoculation, drainage and a reasonably fertile soil with a porous subsoil make a square deal for alfalfa.

I have heard many discussions of methods of growing alfalfa. Everybody seems to have a different scheme. One claims it is best started with a nurse crop. Another says it should be planted alone in June. Still others cry: "Let Jack Frost do it! Seed your alfalfa in the early spring on frozen ground." I am going to set forth



Fig. 18. A Prosperous Farm.

Fine farm homes, big barns and herds of pure bred livestock follow the pathway of alfalfa's growth in Wisconsin.

in this article one general principle in growing alfalfa anywhere, together with a few necessary details. The details are the methods. The important principle is:

See that your soil conditions are right!

Limestone Maps the Alfalfa Area

Make your soil conditions right and you will have success. I don't care what method you use provided it comes within the scope of reasonable farm practice. Money is squandered in trying to grow alfalfa on soil that is not naturally alfalfa soil, without liming, inoculating and supplying the crop with its natural requirements.

When I hear a talk on growing alfalfa in the Middle West or the East I applaud most enthusiastically if the speaker spends three-quarters of his time on lime, inoculation and good drainage, and the rest of the time on methods.

After considerable experience and travel I have come to believe that the greatest cultural factor in growing alfalfa in those sections where it is not a general crop is the use of lime. Alfalfa is a lime-loving plant—more so than any other farm crop. Four tons of alfalfa remove twenty times as much calcium—lime—from the soil as the straw and grain of a thirty-bushel wheat crop. A ton of alfalfa hay contains nearly a hundred pounds of lime!

Limestone has mapped the great alfalfa areas of the United States. It has figured most prominently in the historical development and growth of the crop in this country. Alfalfa was first introduced

into California in 1854. Since then and from there it has spread with amazing rapidity all through the Western States. Why? Because lime is most abundant in those soils.

The Oldest Alfalfa Section in the U. S.

More than a hundred and fifty years ago the colonists tried to grow alfalfa in the Eastern States. It never succeeded. The soil was sour. They did not know about liming at that time. The



Fig. 19. The blue litmus paper turns pink when placed in contact with acid soil.

only place in the East where alfalfa was a success in the early days was Syracuse, New York. Records show that the crop has been grown there successfully for more than a hundred years. Why? Because it is in the heart of a limestone-soil area.

Alfalfa Easy to Grow with Limed Soil

Some farmers grow alfalfa successfully with no more effort than is necessary for timothy. They happen to have natural alfalfa soil—meaning soil containing a goodly supply of limestone carbonates and having good drainage.

All our soils contain lime. They must have lime to support plant growth. But many soils cannot provide a sufficient amount of this necessary plant food for such a lime-hungry plant as alfalfa. Lime on some soils will act as an actual fertilizer for alfalfa, but on most soils it serves principally as the great neutralizer of those soil acids which make the land sour and the alfalfa yellow and sickly.

Rich Land may be too Sour to Grow Best Alfalfa

I have met many farmers who have said: "My land isn't sour—why, it's all upland. It grows sweet grass, like red top and timothy. It grows good corn and potatoes. It's rich land—worth \$150 an acre. It's not marsh land. Haven't any sour slough grass growing on the farm!" (See Fig. 26.)

They forget that corn, oats, potatoes, red top and alsike clover will produce well on a soil much too sour to grow a crop of alfalfa successfully. And it is often true that muck soils which grow the

so-called sour grasses are not acid. They may be just the opposite—especially when they are surrounded by limestone hills whence lime is carried in the natural waters into the marsh.

Is Your Soil Sour?

Soils are sour when they lack sufficient limestone carbonates to counteract or neutralize acids that may occur in both the poorest and the richest of soils. Many of our farms which grow big crops of corn and potatoes need lime to grow alfalfa.

I do not wish to say all soils need lime. That is not true. Very rich soils will sometimes grow alfalfa even though they are quite acid. But so many soils need lime that all should be tested for sourness



Fig. 20. It Tells How Much Lime the Soil Needs.

Truog's test not only determines the acidity of the soil but gives the amount of lime required to grow alfalfa successfully.

or acidity before attempts at alfalfa growing are made. These tests are simple. They will save thousands of dollars that are annually wasted in trying to grow alfalfa on soils too sour for a healthy growth of this crop.

The Litmus Test

Not long ago a grower of alfalfa told me: "The first time I tried testing my soils with blue litmus paper I did it on the sly. I didn't want anyone to know about it, because I really didn't think there was much to it. I bought a dime's worth. Just for my own satisfaction I tried it out with some vinegar and it did turn right red.

"Then I went up into one field where I never could get alfalfa started. It had rained the day before, so the soil was moist. I made a slit in the ground with my knife, put a strip of the litmus in, and closed the dirt about it. I left it there for five minutes and then removed the dirt. Well, sir, that paper had turned to a sort of mottled pink. That meant the soil was sour. I tried it in three or four places by taking handfuls of dirt and making them into balls with the litmus in the center, and they all did the same thing.

"I was just curious enough to haul out three loads of waste air-slaked lime that I got from our dealer and put it on one acre. The next year I inoculated and seeded down to alfalfa and got an excellent stand. The litmus test may not be absolutely reliable for all soils, but it's a mighty close indicator of soil acids.

Truog's Test Best

"I've been reading about the Truog Soil Acidity Test. They say it's a little more complicated, but it's better than the litmus because it tells how acid the soil is and gives one a better idea of the amount of lime to use. I've been sending samples of my soil to the experiment station to be tested for acidity. It gives me a little more confidence in spending money for lime.

"Do you know, it seems mighty queer that this soil about here should be sour. This is a limestone country and a good many round here don't need to buy lime. But it pays me to use two tons to the acre, though nearly all my farm is underlaid with fine gravelly limestone subsoil. The surface is sour. The experts say that rain, with the aid of years of cultivation, has leached the lime out of the top eight inches. This, together with the lime removed in crops taken off the land has seriously reduced the supply. My experience has really shown that.

"I found that the first year after I had seeded alfalfa on my soil, when I didn't use lime the alfalfa never grew well. It was thick enough, but it always looked yellowish and I never got a very good first or second crop.

The next year it would make a surprisingly healthy green and rapid growth.

Limestone Soils May Need Lime

"It gradually dawned upon me that the improvement was due to the fact that the roots in the early life of the crop were drawing their nutriment from the surface soil, in which lime was lacking. Later, when the roots were more widely established in the subsoil, the plants could get all the lime they wanted and they made thrifty growth. I know of a good many farmers who say that their stands and yields of alfalfa improve with age for the first two or three years. Others say just the opposite. I believe the lime content of the subsoil has something to do with it."

This is undoubtedly true. If the surface soil is sour and the subsoil has abundant lime alfalfa will improve rapidly as the roots become established. If both surface soil and subsoil are sour the alfalfa will rapidly deteriorate with age or will fail at the outset. The surface soil may be neutral and the subsoil sour if the land has been cropped heavily, taking much of the lime out of the subsoil and putting it into the surface soil as the manure is returned. Such a condition does not prevent successful alfalfa production. I have observed many excellent fields growing under these very conditions.

The principal point to consider is to have the surface eight inches or more well supplied with lime. It is here that the alfalfa bacteria and the alfalfa roots are most abundant and active, and it is here that they need lime to make conditions favorable.

The Kind to Buy

What kind of lime shall be used? When is the best time to apply it? How shall it be done? These are very common inquiries.

Ground limestone, marl, air-slaked lime, lime refuse from sugar-beet factories or lime kilns, and fresh lime are all good, if bought right and used right. Generally freight is the most costly item in buying agricultural lime. Particularly because of this reason, it is

to the best interest of the lime buyer to look to the moisture content of the product—especially in the case of the so-called waste limes, which are by-products of factories and are often exposed to rain.

Find out Moisture Content of Waste Lime

I bought a carload of lime refuse from a sugar-beet factory, paying less than a dollar a ton. The freight was nearly two dollars a ton. It was excellent lime. I thought it was cheap. It looked dry, but was not dusty—in fact, it felt just a little damp when handled. I had it analyzed. I could hardly believe it when told that it was pure lime carbonate but contained forty per cent moisture! It was very expensive lime when you consider that in a twenty-ton car eight tons were water, on which I had paid sixteen dollars freight.

Ground Limestone Most Commonly Used

Ground limestone rock may come in several grades of fineness—the best grade and highest-priced grade being that ground to the



Fig. 21. A Portable Lime Grinder in Action.

Lime rock which analyzes above 90 per cent carbonates and is easily quarried may be cooperatively ground with portable grinders.

fineness of dust. This latter quality gives the quickest returns, and less needs to be applied. When freight rates are an important item and long hauls are necessary it is best to buy the highest grade because of the smaller amount needed.

A larger amount of coarse ground limestone must be used, but if it can be laid down on the farm at low cost, both for the product and for transportation, it will prove satisfactory and economical if not too coarse.

Use Lump Lime with Care

Fresh lump lime may be the cheapest to use, especially with long hauls from the station and high freight costs. Fresh lime is lime in a concentrated form. One ton of it is equal to two tons of the best ground limestone or air-slaked lime. It is always free of excess moisture. But it is caustic. It burns. If applied directly to the soil it may burn out the humus and injure the soil fertility. It should be used with care, especially when soils are lacking in humus or organic matter. It is unpleasant to handle.

This difficulty can be obviated by slaking the quicklime to a powder before applying. Sometimes this is accomplished by distributing lump lime in piles of about fifty pounds each every two rods on the plowed field.

This gives an application of about one ton to the acre, which will be equivalent in its effect to two tons of the finest ground limestone.

To each pile is added about three gallons of water and it is then covered with soil and allowed to remain a few weeks, until the lime has become well slaked. It can then be spread uniformly over the soil with a shovel.

Lime—A Business Proposition

The kind of lime used is principally a business proposition. Almost any form of lime will neutralize soil acids if applied in a large amount. But it is a matter of judgment to get your soil sweetened for alfalfa at the lowest cost.

The amount of lime required depends upon the degree of soil acidity. The Truog Soil Acidity Tester determines this accurately for all practical purposes. The litmus test does so to a certain extent. If the paper turns a distinct pink rapidly the soil is generally very sour and will require from two to four tons of the best grade of ground limestone, marl or air-slaked lime, or one to two tons of fresh lump lime. If coarse ground limestone is used three to six tons may be necessary. In all events it is always better to apply too much than too little.

At Least Two Tons to the Acre

Not long ago I saw a thick stand of alfalfa that was sickly and yellow. It did not grow. The soil had been limed and inoculated. One and a half tons of ground limestone had been put on each acre the fall before the alfalfa was seeded. We tested the soil. It was still sour.

I asked the farmer what grade of limestone he used.

"I have a little pile of it left over here," he replied. "It's rather coarse."

Yes, it was coarse. A good deal of it was larger than the end of your finger. He should have used at least four tons of this grade of limestone. The increased yield would have paid the extra cost.

You cannot apply too much lime for alfalfa. Twenty tons to the acre would do no harm, but of course dollars and cents will limit the application to about the amount necessary for the neutralization of the soil acids that prevent the proper development of the alfalfa.

Do not be Stingy with Lime

I do not believe it ever pays to be stingy with lime. Two tons of the best ground limestone, or the equivalent thereof in other forms of lime, is none too much for any soil that is sour. The soil may require only one ton of lime at the time of application, but the extra ton will make the effect last over a greater number of years and will insure vigorous alfalfa.

When to Apply Lime

On the heavier soils lime is best applied in the fall. On sandy soils, which leach rapidly, liming in the spring is best. It is always well to give the lime a month or more time to act on the soil and correct some of the acidity before the alfalfa is planted. This is not always necessary, but it is advisable.

How to Apply Lime

Never plow lime under. Put it on the surface soil and harrow it in, so as to incorporate it well with the soil.

On large areas a fertilizer drill can be used in distributing any fine form of lime. Special lime distributors are used with both coarse and fine lime, but with small areas the farmer is hardly justified in buying a special lime drill. He can spread it with a shovel.



Fig. 22. Spreading Lime with a Distributer.

This is not a pleasant job, even on a quiet day. It may necessitate the use of goggles to protect the eyes, and a wet cloth over the nose.

Manure Spreader Works Fine

A manure spreader will eliminate the dust difficulty. Cover the apron with a few inches of fine manure. If you wish to apply three tons of lime to the acre distribute 1500 pounds evenly over the surface of the manure. Set your spreader at four loads to the acre—usually the lowest gear. At this rate you will be applying 6000 pounds or three tons of lime on your soil. With this standard the amount applied can be easily regulated. (See Fig. 27.)

Lime is often spread from a wagon as fast as it is hauled from the car. This saves rehandling.

To gauge your applications, three shovelfuls to a square rod will make two tons to the acre, provided the shovel will hold eight pounds of lime.

Apply Lime as Top Dressing only with Loose Open Soils

Suppose you have alfalfa on a sour soil and it fails to produce well. Is it practicable to apply lime directly to a growing alfalfa field?

Under no circumstances should quicklime or fresh lime be used for this purpose, for the caustic properties of such lime are very apt to kill the alfalfa plants. Finely divided ground limestone, marl or air-slaked lime may be used. They will prove helpful, especially on loose, open sandy soils where the lime will work its way down into the soil where it is needed.

It should be applied early in the spring, before the frost is out of the ground. Top dressing heavy soils with lime will not be nearly so effective, and often satisfactory results are not obtained. Lime applied to a plowed field before seeding is always more profitable than lime applied after seeding.

Giving Alfalfa a Square Deal

Inoculation More Important than Manure

IF A BEGINNER in growing alfalfa were to ask me "Which shall I do, inoculate my field with one load of alfalfa or sweet-clover soil or apply ten loads of manure to the acre?" I should tell him to do both. If he could not do both I should advise him to apply one load of soil.

This is not written to discredit the value of manure. It is written to assert that one load of necessary inoculation soil is worth more in getting a stand of alfalfa than ten loads of manure are worth. This has been shown by experiment as well as by farm experience. Not long ago I received the following letter from a Wisconsin beginner in alfalfa culture:

A Wisconsin Farmer's Experience

"I am in sore trouble. The ten acres of alfalfa sowed last July made a very heavy growth last fall, going into winter quarters with from one foot to sixteen inches covering. It came through fine. It is now from four to twelve inches high and commencing to look yellow and rusty. Upon investigation I can find no nodules on the roots. I limed heavily with air-slaked lime but did not inoculate.

"In preparing the land we plowed under ten tons to the acre of mixed stable manure and cultivated the land until July twenty-eighth, when the seed was sown. Much of the alfalfa is now turning yellow before getting as tall as last fall's growth was, as indicated by the dry stalks now standing above the green, which causes me to think that last year's growth must have exhausted the nitrogen and now, not having nodules on the roots, the plants are unable to gather any from the air and are starving." (See Fig. 29.)

This man inoculated his yellow and sickly alfalfa shortly after the first crop was cut. He spread the inoculation soil with a manure spreader in strips the width of the spreader, but due to a lack of sufficient soil he left a space of eight or ten feet uninoculated every trip he made across the field. He then dragged the field at right angles to the direction in which the inoculated strips ran, so as to spread the inoculated dirt as much as possible. What was the result?

Marvelous Results

Late that summer his field looked like the Star-Spangled Banner, with stripes not red and white, but green and yellow and tall and short. The cross harrowing failed to distribute the inoculation dirt thoroughly, and in consequence the uninoculated strips remained sickly and yellow, while those strips that received inoculation became healthy and vigorous. This is but one of many illustrations I could cite on the value and importance of inoculation.

In Some Places Inoculation not Necessary

"But how is it that over in our country where we have never inoculated we have been growing alfalfa for years with good success?" asked a farmer of one of the Lake Shore counties of Wisconsin.

That was a good question. And what he says is true. Fields along roadsides where sweet clover grows abundantly are inoculated by the bacteria-laden dust that blows over them. Further than that, soils rich in lime, even far distant from any such a source of inoculation as sweet clover, will produce successful crops of alfalfa if in addition to their lime content they abound in fertility, particularly organic matter. In such cases alfalfa draws on the soil for its nitrogen instead of getting it from the air, until it becomes self-inoculated.

But no doubt such fields would give larger yields of alfalfa hay the first two or three years if the bacteria were supplied in large enough numbers by proper inoculation to effect an immediate de-



Fig. 23. Inoculation Increases the Yield and May Prevent Failure.

velopment of nodules on the roots. Often in such cases, especially on poor soils, the second and third crops grow poorly, due to a lack of sufficient nitrogen for the rapid growth of the alfalfa. Yes, there are those who grow alfalfa for the first time without inoculation, but for every success ten or more failures will be reported.

Unseen Builders of Fertility

Not long ago I walked out into an alfalfa field with a German farmer. He was enthusiastic about alfalfa, having twenty acres well established. "I did like you said when I wrote you three years ago. I hauled one load of sweet-clover dirt and spread it over one acre just before I seeded my alfalfa. But one corner I left without the dirt. That winter-killed bad. Blue grass soon came in where I did not inoculate. Where I spread the dirt I got a fine stand. Why is that?"

With a shovel we carefully dug up some of the alfalfa roots. We broke away the dirt and found an abundance of nodules. They were the first he had ever seen. I then explained that those swellings were the homes of the bacteria he had introduced into his soil with the sweet-clover dirt and that the bacteria converted the nitrogen gas of the air into a liquid form which was an actual fertilizer for the plants. (See Figs. 28 and 29.)

We went over to the little strip he had left uninoculated and made a search for nodules. They were very hard to find. He was sur-

prised. I took advantage of his deep interest and pointed out that this alfalfa was not thrifty because it had to depend entirely upon the soil for its nitrogen and there was not a sufficient amount available to supply the needs of such a rapid-growing crop as alfalfa. On the inoculated area the bacteria supplied the deficiency and the alfalfa was thrifty. (See Fig. 29.)

"More people will inoculate when they know what it means," he declared. "Alfalfa makes the land rich and the farmer rich too!"
Nodules on Alfalfa Roots Worth Thousands of Dollars in Building up Soil!

There are many who have never seen the root nodules of alfalfa or of clover. They are too busy making money to have time for the inspection of the swellings on alfalfa or red-clover roots. Yet those very nodules are worth untold thousands of dollars to the farmers of every land in keeping up the soil fertility. Without



Fig. 24. Sweet Clover Dirt for Inoculation.

Along the roadside where sweet clover is growing inoculated soil can be obtained.

them the country might face famine, due to a depletion of soil nitrogen. Many of the worn-out and abandoned farms of the Eastern States would still be productive if they had been managed with legumes instead of with timothy and grain alone. (See Fig. 7.)

Ancients Knew Alfalfa Made Soil Rich

The soil-enriching properties of leguminous crops were appreciated centuries ago. Columella, an ancient Roman writer, wrote not less than 1800 years ago that alfalfa "dungs the land." It makes the soil rich.

But it was only thirty years ago that scientists discovered why alfalfa improves the fertility of the soil. It was only thirty years ago that those minute bodies or organisms we now call bacteria were discovered. They have since had a most profound influence on agricultural practice.

Our best farmers have been employing these unseen builders of soil fertility on their farms by growing legumes—alfalfa, clover,

soy beans, cowpeas and so on in proper rotation with other crops. They minimize the fertilizer burden which is inevitably levied upon depleted soils. They keep up soil fertility, which is the basis of rural prosperity.

Inoculation not Expensive

Inoculation means simply the introduction into the soil of the right bacteria for alfalfa. Most soils are filled with the proper bacteria for clover and it is only in a few places that inoculation is necessary for that crop. But where alfalfa is a new crop the alfalfa



Fig. 25. Spreading Inoculation Soil by Hand.

Where the dirt is spread by hand the distribution is more uniform and 500 pounds an acre is sufficient. If spread with a shovel a load per acre should be used.

germs are not present in sufficient numbers properly to assist the crop in its growth and development. Clover germs will not develop on alfalfa roots. Consequently we must inoculate with alfalfa bacteria. This is not a difficult or costly process.

Sweet Clover Assists

Along the roadsides of many sections a formerly much-despised weed but now a valued farm crop grows wild and luxuriant. It is the sweet-clover plant—first cousin of alfalfa. It, too, has bacteria and nodules on the roots, and they are identically the same germs that are so necessary for alfalfa. A load or ton of the surface eight inches of dirt taken from roadsides where sweet clover is growing, spread over each acre of the field just before seeding the alfalfa, and then harrowed in, will accomplish the proper inoculation. Soil transferred from a successful alfalfa field is likewise satisfactory.

Inoculating Alfalfa Seed

The Alfalfa Order, Madison, Wis., will supply at cost price of about 25 cents an acre, inoculation cultures in bottles, to farmers, with complete directions for applying these bacterial growths to the alfalfa seed prior to sowing. The cultures are carefully prepared by

the Wisconsin Experiment Station. While this method is not so certain as spreading inoculated soil, very good results have obtained where these fresh cultures have been used.

Mix Alfalfa With Timothy and Clover

A good scheme to get the entire farm inoculated for future crops of alfalfa is to use a mixture of two pounds of alfalfa seed an acre with every grass and clover seeding.

The scattered alfalfa plants gradually develop the inoculation in the soil in two or more years. Inoculation is hastened if the alfalfa seed is first treated with a good inoculation culture or an equal weight of fine dried sweet-clover or alfalfa dirt. A weak solution of glue or molasses is used to dampen the seed slightly before the dust is applied. A little care must be used to avoid having the seeds stick together in bunches.

Glue Method of Inoculation

The glue method of inoculating alfalfa seed is simple, convenient and quite effective. The plan is to coat the seeds with inoculated soil—that is soil containing the proper nitrogen gathering bacteria for alfalfa before planting. Proceed as follows,—Dissolve two handfuls of furniture glue in a gallon of boiling water. Allow this solution to cool. Moisten the seed (do not wet it) with dilute glue using about one quart of the solution for one bushel of alfalfa seed. Sprinkle the glue on evenly and stir the seed thoroughly so as to get each seed slightly moist.

Now then we are ready to apply the inoculation soil. Go along the roadsides where sweet clover is growing and dig up about a gallon of dirt for each bushel of alfalfa seed. Dig this dirt near the sweet clover roots. If you do not have sweet clover growing in your section, soil from a successful alfalfa patch will, of course, serve the same purpose and will be equally effective. Dry this soil in the shade or in the barn or basement where the direct rays of the sun will not reach it. After it is dry pulverize it by hand into a fine dust. Scatter this dust over the moistened seed stirring vigorously so as to mix thoroughly at the rate of about one gallon of soil to one bushel of seed. While the alfalfa seeds may stick together somewhat when first moistened with the glue solution, after the application of the dry inoculation dirt they separate readily and no difficulty will be experienced in seeding. This method of inoculation is especially advantageous where the supply of inoculation soil is shipped from a distance or otherwise limited.

Lasts Many Years

Inoculation is neither difficult nor expensive. As far as we know, a field once inoculated is always inoculated. However, where alfalfa is not grown for an interval of six or eight years reinoculation is helpful.

Getting Started With Alfalfa

The Time, the Place and Amount to Sow for Best Results

SO MUCH is written about growing alfalfa that we must use the proverbial grain of salt more or less liberally in applying what we read to our local farm practices. One thing sure is that we farmers east of the Mississippi and north of Mason and Dixon's line must keep our ears closed to much of the advice that hails from the Far Southwest.

Such information as five pounds of seed being sufficient for one acre may apply to a semiarid country, like many of the alfalfa-growing sections of the West, but not to those humid areas where the annual precipitation is round thirty inches. Likewise with late fall seeding, which is probably most advantageous where mild fall and winter climatic conditions obtain, but not where winter temperatures begin in November. (See Fig. 33.)

Beware of Southwestern Advice

"But," our Western friends argue, "is it not true that five pounds of alfalfa seed distributed over one acre will give you twenty-five seeds for each square foot of surface? If twenty of those produce alfalfa plants you will have a good thick stand. Why use twenty pounds of seed to the acre?"

What they say is all very true, but there are some "ifs" to be considered that distinguish between theory and practice in the humid states. If we had a perfect seed bed—a soil abundantly supplied with lime and organic matter, well drained, thoroughly inoculated and weed-free; if the alfalfa seeds germinated 100 per cent and if they were distributed uniformly and all covered just deep enough—not too deep or too shallow—for germination; if we had neither drought nor excessive rain, then, to be sure, three to five pounds an acre would be a great sufficiency.

Fifteen to Twenty Pounds of Seed Best for Beginners

But herewith are the actual facts and figures from a co-operative experimental test made by 180 Wisconsin farmers, who for a period of three years compared ten and twenty pound rates of seeding. Eighty-one per cent of these practical farmers reported that blue grass and weeds gave much more trouble with the ten-pound rate and that the twenty-pound seeding gave a larger yield of finer-stemmed alfalfa and consequently a hay of much better quality.

In answer to the question "Which is the best rate of seeding on weed-free, not acid, inoculated, and carefully prepared soil?" replies were received as follows:

- 47 per cent declared for 20 pounds an acre.
- 36 per cent declared for 15 pounds an acre.
- 17 per cent declared for 10 pounds an acre.

Even under excellent soil conditions the farmers' verdict is in favor of the fifteen and twenty pound rates. But when alfalfa was seeded for the first time under average farm conditions, with the

seed bed fairly well prepared, but somewhat weedy, the replies were decidedly for the heavy seedings:

91 per cent declared in favor of 20 pounds an acre.
7 per cent declared in favor of 15 pounds an acre.
2 per cent declared in favor of 10 pounds an acre.

Naturally the farmer would prefer the ten-pound rate because of the lower seed cost, but in spite of this his judgment is for double the amount, especially for those beginning alfalfa growing. This should not convey the impression that a few extra pounds of seed will make up for a poorly prepared seed bed, but it does mean that weeds and blue grass necessitate heavy seeding for the farmers of the East and Middle West.

Less Seed Required with Good Soil Preparation

After alfalfa has been successfully grown for a number of years on a farm and the soil has become thoroughly inoculated and adapted, ten to fifteen pounds an acre may prove sufficient. This is especially true when good seed of the hardy and wide-spreading strains of variegated alfalfa, such as Grimm, Baltic, Canadian or Cossack, is used.

The Eight-Inch Rule

It is not possible to formulate a rigid set of rules for growing alfalfa, but here is one that can always be safely followed: Alfalfa should have a growth of at least eight inches before winter weather occurs. It requires this amount of growth to withstand the rigors of alternate freezing and thawing. (See Fig. 45.)

Late Summer Seeding Dangerous

This means that the seed must be sown in the spring or early enough in the summer or fall to arrive at eight-inch development before the first alfalfa-killing frosts. August seeding may do very well where growing weather lasts well on into November, but it is very risky in such northern states as Wisconsin, Michigan and Minnesota. In the northern part of these states I have known of failure by winter-killing of alfalfa seeded July fifteenth, while success obtained in adjacent fields seeded in June.

Because of widely varying soil and climatic conditions it is impossible to set a definite date after which it is too late to seed alfalfa in any given locality, but the eight-inch rule will apply most emphatically where winter-killing is a problem to be contended with.

Slow Spring Growth Follows Late Summer or Fall Seeding

A plant with its root system well established is equipped to withstand cold and freezing much better than one that has just started to grow. This is well illustrated by an experiment at the Wisconsin station. Seedings were made August fourth and twenty-fifth, September fifteenth and twenty-fifth. The following spring a remarkable difference in the size and vigor of growth resulted—the later seedings being decidedly weaker, in spite of the fact that excellent fall growing weather occurred after each seeding and the winter was very mild. Under severe climatic conditions undoubtedly the last three plantings would have entirely winter-killed. The relative root and stem growth the following May is shown in the table: (See Fig. 33.)

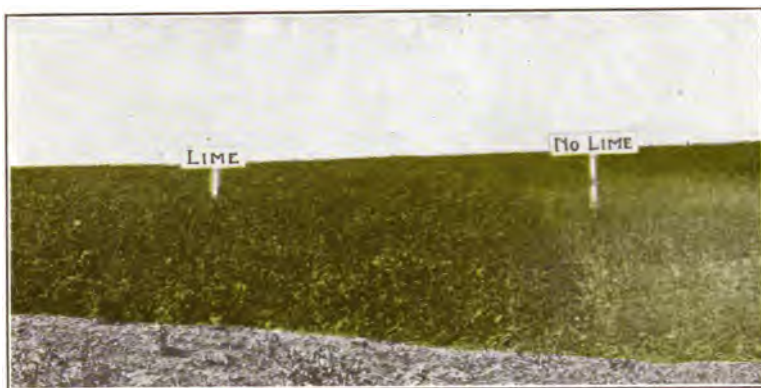


Fig. 26. Success vs. Failure.

This field would produce in average years 75 bushels of corn an acre but it was too sour to grow alfalfa, until lime was applied. The presence of weeds and the yellow color and sickly growth of the alfalfa on the unlimed corner was visible for a distance of one-half mile.



Fig. 27. Lime is conveniently distributed with a manure spreader.



Fig. 28. Fertilizer Factories on Roots of Alfalfa.

The little white swellings or nodules on alfalfa roots are sure indications of proper inoculation. They are the homes of millions of alfalfa bacteria which gather nitrogen from the soil air and convert it into an actual growth producing fertilizer for the alfalfa plants.

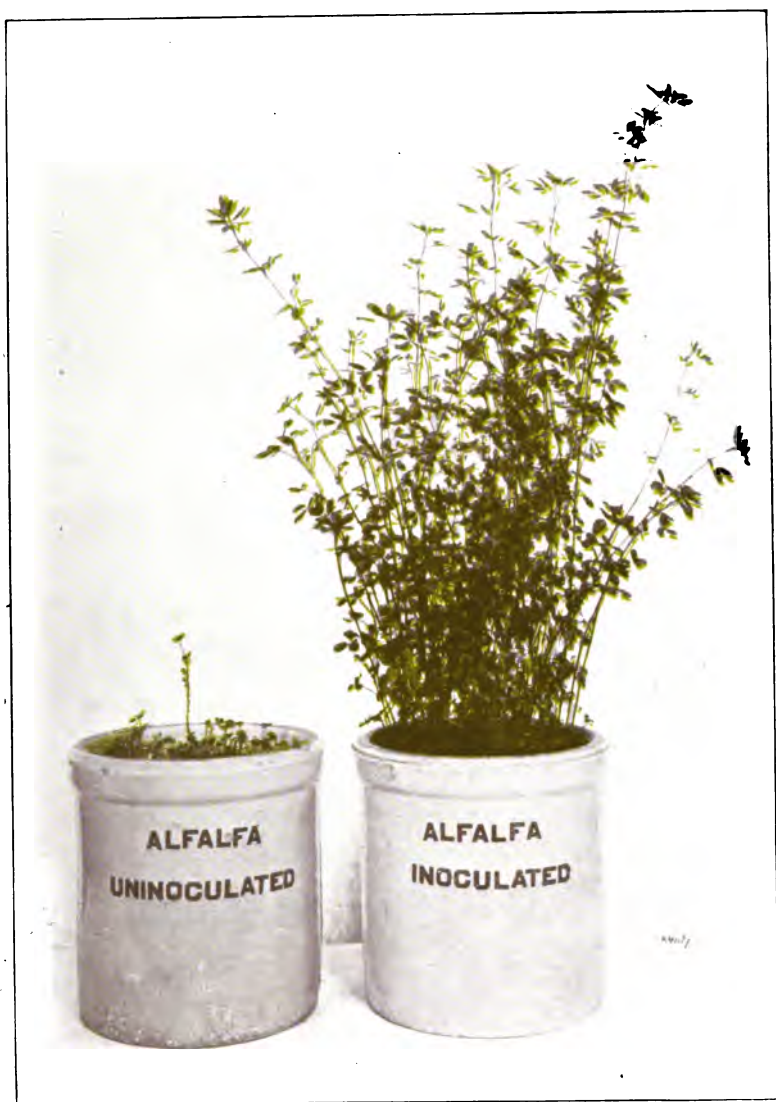


Fig. 29. Inoculation or Starvation.

Each jar contains pure quartz sand to which all the necessary elements for plant growth, except nitrogen, have been added. The alfalfa bacteria supplied by inoculation have taken sufficient nitrogen from the air to produce a healthy growth of alfalfa. The alfalfa plants in the sand receiving no inoculation have starved for a want of nitrogen. Especially on sandy and other soils, which may lack nitrogen, inoculation is very important.

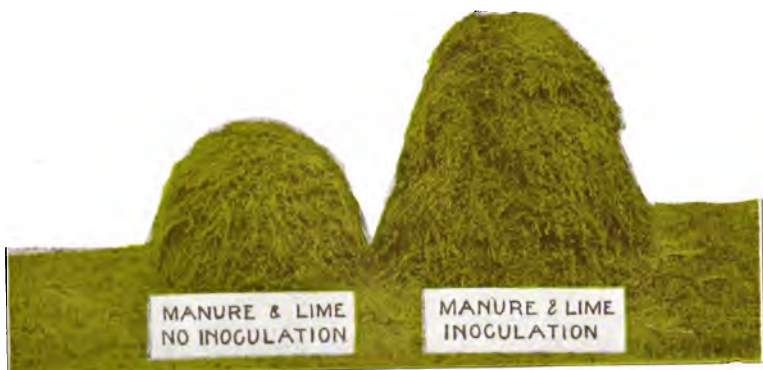


Fig. 30. Convincing Evidence of the Value of Inoculation.

Manure and lime, with inoculation, yielded 2500 lbs. alfalfa an acre.
 Manure and lime, with no inoculation, yielded 1180 lbs. alfalfa an acre.



Fig. 31. Alfalfa for Hay. Corn for the Silo.

Surely, with these, our banner feed producing crops, "prosperity follows the plow."



Fig. 32. Alfalfa, Grown in Wisconsin.
Slogan of the Alfalfa Order.



Fig. 33. Effect of Late Summer Feeding on Root Growth of Alfalfa Following Injury. See page 24.



Fig. 34. Haying to Beat the Weather.
Cutting forty acres of alfalfa a day on the Cornfalfa Farms,
Waukesha, Wisconsin.



Fig. 35. Curing in Windrows Saves Leaves.
Alfalfa hay is readily raked into windrows with side delivery rakes.



Fig. 36. Where soil conditions are made right alfalfa produces abundantly.



Fig. 37. Late Fall Cutting and Pasturing Cause Winterkilling and Blue Grass Troubles.

Photo taken in May 1915. The left part of this field which is so badly winterkilled and overrun with blue grass was cut the previous fall (1914) on October 12. The alfalfa on the right was not cut after August 30, in 1914 and came through the winter uninjured. In the northern states cutting or pasturing after the first week in September is poor practice.



Fig. 38. Turkestan Alfalfa Makes a Scant Fall Growth.
Perhaps this is one reason for its hardiness.



Fig. 39. Transplanting in this test gave very poor yields of hay in comparison with the broadcasted plots.

DATE SEEDED 1914	LENGTH OF ROOTS	LENGTH OF STEMS
	MAY 12, 1915 Inches	MAY 12, 1915 Inches
August 4	20	20
August 25	13	17
September 15	10	13
September 25	8	8

Alfalfa Needs a Reasonably Fertile Soil.

Because alfalfa is a great soil enricher and can be grown on a wide range of soils, all the way from heavy clays to sandy loams, it is often tried out on the poorest and most worn-out part of the farm. If the soil happens to be well supplied with limestone the crop will do fairly well on rather poor land, but there is such a thing as a



Fig. 42. Best to Choose a Sloping Field.

Flat lands will grow alfalfa but smothering ice sheets like this may cause winterkilling.

farm being too poor to grow alfalfa. It may grow red clover or sweet clover, but when the land becomes so deficient in organic matter and fertility that we say it "won't grow beans" it will not grow alfalfa without heavy applications of manure or fertilizer.

On the other hand, newly cleared lands, virgin soil and grass soils may be very fertile and yet fail to produce good stands of alfalfa. Such soils need first to be subdued by cropping a number of years with such cultivated crops as corn or potatoes in rotation with grain and clover to get rid of the Bluegrass.

A Loose Sub-Soil Best

The subsoil must be considered. If it is loose and open, affording good underdrainage, and is full of gravelly limestone, nothing could be more ideal. If it is a tight, impenetrable hardpan within six or eight inches of the surface beware. Shallower rooted crops, like timothy, redtop or alsike clover, will do better.

Choose a Gentle Slope

A gentle slope should be selected. Flat land will grow alfalfa, but winter-killing will be more common. Water from rain or melting snow gathers on the surface, and if freezing weather follows ice sheets form and the winter is more severe. Land in which the water



Fig. 41. The corrugated roller breaks coarse lumps, firms the seed bed and leaves the surface loose.

table is only two feet below the surface is best avoided. The old "alfalfa-won't-stand-wet-feet" theory holds pretty well. Other conditions being favorable, tile-drained land is satisfactory, but occasionally trouble is reported because the alfalfa roots clog the drains. Though the danger is slight and seldom serious it is well worthy of mention.

A Firm Settled Seed Bed Necessary

Three years ago I observed a forty-acre field of alfalfa that had been seeded the year previous with one bushel of barley to the acre as a nurse crop. The land was heavily limed and manured and inoculated. Climatic conditions were very favorable. Yet the alfalfa was a miserable failure. Why? A loose seed bed.

The soil was plowed just one week before the seeding of the alfalfa and barley. It did not have time to become firm. The capillary movement of the moisture from the subsoil was retarded and the alfalfa plants did not thrive. Even the barley was a poor crop. Fall plowing of the heavy soils has its many advantages for all crops, but its principal benefit for alfalfa is that it gives the seed bed time to settle and become firm enough to meet the requirements of the alfalfa plant.

The forty-acre field mentioned was plowed up in the fall and successfully reseeded to alfalfa the following spring.

Rolling a Very Desirable Practice

Rolling is the only practice that will firm the seed bed sufficiently when the seeding of alfalfa immediately follows plowing. The roller is best used right after the seed is sown and should be followed by a light harrowing to form a mulch. Harrowing is not necessary when corrugated rollers are used. They firm the soil but leave at the same time a loose surface.

Loose Sandy Soils Need the Roller

Particularly with open sandy lands, which because of leaching and blowing must often be spring plowed for alfalfa, is rolling essential. It brings on a rapid and uniform germination of the seed. During dry weather it keeps the surface supplied with moisture, which naturally moves up from below when the soil particles are in close contact.

A well-settled seed bed, with a mulched surface sufficient to cover the seed and to prevent baking and crusting and the rapid evaporation of soil moisture, is ideal not only for alfalfa but also for all our grain crops with which alfalfa is so often seeded.

Getting a Good Stand of Alfalfa

The Use of Nurse Crops and Other Methods of Establishing a Good Stand

WHERE there is a will there is a way, but there are so many good ways of getting alfalfa started that it is hard to say which is the best. What may be a good method for one farm would not apply entirely to another, but almost any method will succeed when there is the determination to grow alfalfa and the willingness to follow details.

The great importance of lime, inoculation and a firm seed bed has been previously discussed. It remains now to consider the most economical plans for establishing a good stand of alfalfa. In the West the proposition seems to be pretty well solved. Sow from three to fifteen pounds of seed on a firm but well-prepared seed bed, with or without a nurse crop in the spring or summer, and a thick growth is generally obtained, unless the drought is too severe or the insect pests are too abundant.

For the Central and Eastern states the establishment of a field of alfalfa is somewhat more of a problem. At least there is a "newness" about it that has not yet worn off, and every now and then somebody advocates a brand-new, "never-known-before" method of starting alfalfa.

Grain Instead of Weeds for a Nurse Crop

The most universally followed way of growing alfalfa on heavier soils of the humid regions is to seed with grain in the early spring the year following a cultivated crop, such as corn or potatoes. The term "nurse" crop is very deceiving. From it we infer that the alfalfa is protected and nursed along by the grain crop. The fact is that a nurse crop robs the tender alfalfa plants of moisture, plant food and sunlight, and checks their development, very severely on sandy soils.

But suppose we plant the alfalfa alone in the early spring—what will happen? Weeds, and lots of them, come forth. They will be far more detrimental than a grain crop, and far less profitable. The great advantage of the nurse crop on the heavier types of soil is that it controls the common weeds of the farm and produces a profitable crop of grain while the alfalfa is becoming established. And it is a decidedly convenient, economical and a reasonably certain method of seeding any hay crop on fertile clay or loam soil.

In the spring the grain and alfalfa are sown at the same time with one operation, using a grain drill or seeder having a grass-seed attachment. Winter wheat and winter rye are generally seeded so late in the fall that if the alfalfa is sown at the same time it will invariably winterkill.

Spring Sowing on Fall Seeded Grains

To avoid this danger the alfalfa should be sown separately on these fall-seeded grains with a wheelbarrow seeder or other suitable machine early the next spring before the frost is out of the ground, and preferably on top of the last 'snow. When a loam or clay soil thaws out it becomes honeycombed with cracks and small crevices, which later close up and cover the seed.

This is Nature's way, and it is far more effective on heavy clay or loam soils than harrowing or any other mechanical means of covering seeds sown after the soil has thawed. Alfalfa, like clover seed, is not injured by being seeded on snow or frozen ground, and germination is immediate with the on-come of warm weather. Light, sandy soils should be seeded after thawing and a vigorous harrowing of the fall sown rye or wheat is necessary to cover the alfalfa seeds.

Sow Nurse Crop Thin

There are good and bad nurse crops. The poorest are those which ripen latest and remain growing on the field longest. But every nurse crop is bad for alfalfa when sown too thickly. Three bushels of grain to the acre will spell failure for an alfalfa seeding, when one



Fig. 42. A Thin Nurse Crop for Thick Alfalfa.

Good stand seeded with one
bu. barley an acre.

Poor stand seeded with three
bu. of oats an acre.

bushel would have insured success. The newly sprouted alfalfa must have a fair chance for growth. One bushel of grain to the acre is just enough to produce a fairly good grain yield; at the same time it does not crowd the alfalfa plants, but gives them an opportunity to get their roots well established for protection against drought, which may follow the grain harvest.

Good and Bad Nurse Crops

Barley is one of the best of nurse crops. It ripens early. Winter rye and winter wheat are also good. These grains mature from one to three weeks earlier than oats and spring wheat and they are much better for seeding with alfalfa. Because of late ripening it is best, but not always necessary, that oats be cut for hay just after heading out, unless early strains, such as the Kherson and Sixty Day, are used.

The principal objection to all nurse crops is that they dry out the soil—especially, the late-ripening kinds—and check the develop-

ment of the tender young alfalfa plant so that an extended drought following the grain harvest may ruin the stand. This is a difficulty far more serious with sandy or light soils because they are so readily affected by drought. This danger is sufficient to make the nurse-crop way of starting alfalfa a failure with sandy soil but not generally with the heavier clays and loams. We shall see, however, that it can be avoided.

Seeding Alfalfa Alone

The surest but most expensive way to seed alfalfa, especially on sandy ground, is to put the soil through a careful weed-killing process of disking and harrowing at frequent intervals, and seeding in May or early June. If the soil is extremely weedy the cultivation



Fig. 43. Seeding Alfalfa with Barley.

Flat rollers should be followed with a harrow. Otherwise the smooth surface may bake, crust and harden.

should be continued well on into the summer; otherwise June seeding is most satisfactory, for heavy soils and May or June for light soils, and one or two cuttings of hay may be obtained prior to September first. This will in a measure make up for the profits of a grain crop.

Though excessive cultivation kills weeds, stores up moisture and firms the seed bed, it would not be necessary if the soil were weed-free, or nearly so. Clean clay or loam fields growing such well-cultivated crops as tobacco, sugar beets and potatoes can often be fall plowed, disked, harrowed and inoculated, and the alfalfa seeded alone on frozen ground the following spring. Two fair crops of hay, rarely three, may be cut in the summer, although the first is apt to be very weedy.

Jack Frost Methods

But very seldom do we find soils that are free enough of weeds and weed seeds to warrant this "Jack Frost" way of seeding alfalfa alone. I have seen it tried, and instead of cutting nice crops of alfalfa the first year the harvest was mostly weeds. A grain crop would not have crowded the alfalfa any more than the weeds did and surely would have been more profitable. It is best for the be-

ginner in alfalfa growing to use a standard method that has passed the experimental stage, and let the more experienced growers try their luck with Jack Frost.

Seeding Alone—Best for Sandy Soils

Though the weed-killing process is expensive, seeding alone in May or June, is a method of growing alfalfa that practically insures success, because it eliminates the drought danger that obtains with the nurse crop and the weed danger of seeding alone in the early spring. It is particularly a method to be recommended to the beginner, who would best start out in a small way with three to five acres. It gives him time to lime if necessary, to inoculate, and it makes the most ideal seed bed for alfalfa. One or two crops of hay may be cut prior to September first if abundant summer rains occur. It is the surest method on sandy soils.

Look Out for Soil Washing

Its greatest drawbacks are extra labor and expense and possible loss of the use and profit from the land the first year. It can be used only with fields that are not too sloping, otherwise serious washing and gullying will occur. Hilly lands should always be seeded down with a nurse crop. After the farm has grown alfalfa for a number of years, and the fields are plowed up for corn, they can then be reseeded to alfalfa with grain in a less expensive manner.

Seeding After Harvest of Canning Peas, Early Potatoes, etc.

There are other ways of seeding alfalfa alone. Such crops as early potatoes, canning peas, oats and peas for hay, are harvested early in the summer. Rains generally occur after the harvest and by immediate seeding good stands of alfalfa are obtained. The weed growth at this time of the year will seldom prove to be detrimental. The seed bed should be prepared with the disk and harrow—not with the plow. Plowing would leave the seed bed too loose for immediate seeding unless heavy rolling was practiced. Disking is decidedly satisfactory and is more economical.

Seeding After Grain Harvest Doubtful

This same practice is seldom successful with the grain crops, which are harvested much later. They dry out the soil and quite generally drought follows their harvest, which makes the preparation of the seed bed almost impossible either with a disk or plow. With late-fall growing weather, seeding after a grain crop may prove successful, but here again eight inches of growth prior to freezing weather is necessary to insure winter protection of the alfalfa.

Seeding in Corn at Last Cultivation

Some successes and many failures have been reported in seeding alfalfa in corn just before the last cultivation. The writer has tried this out from time to time with little success. Occasionally it works, and those occasions occur when the rainfall during the summer is abundant. Some difficulty will obtain in getting the seed distributed uniformly unless a special inter-row seeder is used. An experienced sower can spread the seed by hand uniformly and if care is used the whirling seeders are satisfactory.

If the soil has not previously grown alfalfa it should be inoculated at corn-planting time, or the seed may be treated with a good bacterium before seeding. The corn is cut for silage or fodder, and unless the stubbles are harrowed down the following spring they will cause considerable trouble with the first cutting.

Quack Grass—Fiercest of all Farm Weeds

Weeds are always with us and they profoundly affect all our methods of crop production. Canada thistles are no match for an established field of alfalfa when the two plants come into a hand-to-hand combat for possession of the soil. But not so with the fiercest of all farm weeds—quack grass.

This dreaded enemy will get the best of alfalfa unless badly infested soils are freed of its aggressive growth by cultivated crops or summer fallow before the alfalfa is seeded. Even then a few spots of quack may appear throughout the field, and no matter how thick the alfalfa may be these spots will survive in spite of its rapid growth and frequent cuttings. Though we can grow good crops of alfalfa hay, even though the field may contain a few patches of quack grass, we can never hope to eradicate this weed with alfalfa as we can get rid of Canada thistles.

Helpless as a New-Born Babe

With all due credit to alfalfa as a weed fighter, it must be stated that during its first six months of growth it is quite as helpless as a new-born babe to control those too numerous common weeds of the farm, such as foxtail, pigweed, lamb's-quarters, and so on. While they menace alfalfa in its early stages they seldom cause sufficient injury to the stand to require any attention in the way of control except for those weed-killing cultural practices which are applied to the soil before the alfalfa is seeded.

Weeds May be a Protection

Last August I visited a number of newly seeded alfalfa fields in a central state. Some of them had been sown with a nurse crop last spring; others had been sown alone in June. They were all very weedy.

"Where in the world do all those weeds come from? My land is usually not weedy and I use good, clean seed. What shall we do about them?" These were universal questions wherever I went.

"Let them alone," I replied. "They are short and nearly ripe now and will soon stop growing. This winter the dead stalks will hold the snow and prevent winter injury from alternate freezing and thawing. The dry weather has been favorable to their growth. They do some damage, but cutting them close to the surface would hurt the alfalfa still more.

Clipping First Year to be Avoided

"It's only when weeds get up about two feet high, and are so thick that the alfalfa is in danger of actually being crowded out, that clipping should be practiced. Then get out your mower and whack them off, setting the cutting bar at least six inches above the ground, so as to cut as little of the alfalfa and as much of the weeds as possible. Haul off the clippings before they smother the plants

beneath. Attend to this in August. Late fall clipping or cutting or pasturing is very dangerous to a new stand of alfalfa. It brings on winterkilling, because the alfalfa may not recover rapidly enough to make the necessary eight inches of growth before winter sets in.

Manuring New Seedings Dangerous

Ten tons of rotted manure applied as a topdressing to a plowed field and disked in will do much to insure a good stand of alfalfa. Ten tons of manure, especially if strawy, applied on new alfalfa seeding the first fall may smother out the plants and actually ruin the field. The idea of applying manure on the first year's growth



Fig. 44. Second Crop. Two Tons Per Acre.

Alfalfa is easy to grow where seeded right on a reasonably fertile soil, well inoculated and abundant in lime.

for winter protection is entirely erroneous, unless a very light application of fine, well-decomposed manure is used. After alfalfa has passed its first year it is not nearly so sensitive, and light applications, preferably in the fall, of from six to eight tons of well-rotted manure will increase the yields greatly.

Use Good Clean Seed

In all the discussion it has been taken for granted that lime and inoculation have been provided for. No method will succeed unless the soil conditions are right. Clean seed of good germination should be used. It is generally broadcasted and harrowed in. Drilling in alfalfa seed in rows four to six inches apart is very satisfactory, especially on sandy soils, but there is a grave danger of getting the seed too deep for germination. Half an inch is sufficient depth on heavy land and it should not be drilled in more than two inches in the light sands of the humid states. Under semiarid conditions, when the soil is very loose and dry on the surface, alfalfa is sometimes seeded three inches deep. Like corn and clover, alfalfa should be sown just deep enough to come in contact with sufficient soil moisture to sprout the seed and to get the young plants well established in the soil—no deeper.

A Permanent Stand of Alfalfa

Winter-killing and its Remedies

I'M PRETTY well soured on this alfalfa business. That fine ten-acre field west of the barn which I seeded two years ago is as dead as a doornail this spring. My neighbor's field across the road is in the same boat. Why, I got fifty loads off that patch last summer and I booked it for another fifty this year.

"You wouldn't think a crop with such powerful roots would winter-kill. But the blamed stuff certainly does. You can go into my field and pull up dead alfalfa plants by the thousands. It is easy enough for some of these fellows to tell us how to grow alfalfa, but how are we going to keep it after we once get it growing?—that's what I would like to know."

This is not a one-man outburst. It represents the sentiments prevalent among 5000 or more alfalfa growers in Northern Illinois, Ohio, Indiana and Wisconsin last spring (1916). Never in years had there been such wholesale winterkilling of good stands of alfalfa and clover and even of fall wheat and rye.

Winterkilling Disappoints

Yes, alfalfa, like clover, winterkills; but it is not necessarily the cold winters with extremely low temperatures that do the damage. It's the open winters, with little or no snow for protection against heaving and injury from alternate freezing and thawing, that cause havoc in our best fields of clover and alfalfa.

Flat lands are affected worst of all. Here the water from melting snow or spring rains accumulates and with cold weather smothering ice sheets put an end to the alfalfa beneath. What are we going to do about it? Shall we look at it as beyond prevention, as we would a hailstorm or a drought in the summer, or can winterkilling of alfalfa be controlled? We shall see. (See Fig. 40.)

First of all, winterkilling is only a problem in those more Northern States where the winters are quite severe. Let me say at the outset that I have no patience with the chronic kicker in those sections who complains about the loss of his alfalfa when he has cut or pastured it late in the fall or at any time after the first part of September.

Resist that Temptation

"Oh, that doesn't hurt it. I cut mine in October two years ago and it came through the winter in fine shape. Why, my neighbor fall-pastured his right down to the ground and you never saw a better field the next year." I have heard this argument time and again.

"But how about it this spring?" I inquire.

"Oh, it's just like mine. It's dead!"

Don't Kill the Goose

We forget that some winters may be so favorable that the alfalfa is not seriously injured in spite of late cutting or late pasturing.

I know it is a great temptation to cut a fourth crop or to pasture it off late in the fall. Sometimes we are short of feed and we just have to take the hazard. But in doing so we are apt to kill the goose that lays the golden eggs.

Late Cutting Reduces Vigor

The field may be only partially ruined by winter's freezing, but the late cutting so weakens the remaining plants that their growth the following spring will be less vigorous, and the blue-grass and weeds may soon get the best of the alfalfa. (See Fig. 37.)



Fig. 45. Eight inches of fall growth holds the snow for winter protection.

The old standard eight-inch rule—that alfalfa should have eight inches of growth before freezing weather sets in—will solve the winterkilling problem on many farms. Alfalfa needs this much stubble to hold the snow for winter protection.

May Kill in Spite Care Taken

But it still remains that even where every regulation of growing and handling alfalfa has been followed out, it may winterkill. Where this occurs there is only one solution of the difficulty: Use seeds of the hardiest-known varieties.

There is all the difference in the world between various kinds of alfalfa. Some, like the Peruvian of the Southwest, cannot stand the slightest Northern frost. Others will weather through the hardest winters and be ready for business the following spring. (See Fig. 50.)

I will not say that any alfalfa is absolutely winter-proof, but there are varieties that have a double-barreled, cast-iron hardiness which makes them nearly so, and far superior to the common kinds in withstanding the rigors of severe open winter weather. (See Fig. 51.)

Common American Alfalfa

There are few commercial varieties of alfalfa grown here in the United States. The common purple-flowered alfalfa is the great

American variety. The original stock was brought from Spain to Chile and from there it was introduced into California during the gold-rush days, about 1854. Since then it has spread all through the West and today it is the great commercial alfalfa of the United States.

It is an excellent variety—a good producer—fairly hardy, with a desirable erect and upright growing habit.

On the market the seed is offered as “Montana grown,” “Kansas grown,” “Dakota grown,” and so on, depending upon the state in which it was produced. There is a preference for common alfalfa seed from the Northern States, and in years of a big crop the Northern-grown alfalfa seed sells for two to four dollars more a bushel than seed produced in Kansas and Nebraska, because it is claimed to be hardier.

Kansas as Good as Montana Seed

I have tried out alfalfa seed from all these states, and in numerous co-operative tests throughout Wisconsin I have found alfalfa from Kansas and Nebraska seed as hardy and productive in every respect as that from the common seed produced in the Dakotas or Montana.

As stated before, winterkilling is not due to extremely low temperatures so much as it is to alternate freezing and thawing with little or no snow covering for protection of the alfalfa. Surely alfalfa in Kansas and Nebraska is put to the test of just such injurious winter weather.

Though I have not tried alfalfa seed from every seed-producing county of the states mentioned, the matter of the locality in which the seed was produced seems to be of far less importance than has been previously supposed. The fact is that all common alfalfa is liable to serious winterkilling, whether it be from Kansas or Montana-grown seed, especially in those years when snow does not protect it.

When Common Alfalfa Winterkills

In June, 1914, I seeded sixteen separate plots with various strains of alfalfa seed coming from Kansas, Nebraska, Montana and the Dakotas. Excellent stands were obtained in 1915. But the winter of 1915-16 took its toll. Only four of those plots came through in excellent shape.

Fifty-five per cent of the plants in the several Dakota and Montana plots were killed. Last summer (1916) those plots yielded in two cuttings only 3842 pounds an acre of cured alfalfa hay. The two Kansas and Nebraska plots winterkilled fifty-two per cent, but yielded 4470 pounds of cured hay an acre in two cuttings.

The four banner plots were seeded with seed of the variegated varieties of alfalfa—two with Grimm and two with Baltic. The average winterkilling for these four plots was only twenty-seven per cent and the remaining plants spread out so rapidly and so early in the spring that this injury was not even perceptible. These four plots averaged 6045 pounds of cured hay an acre in two cuttings—a ton more than the common kinds that had been seeded under identically the same conditions. (See Fig. 48.)

Winter Resistant Alfalfas

There is no doubt about it—the best alfalfas for those sections where winterkilling is a problem are the variegated strains. They are the hardiest longest-lived and best all-round producing alfalfas yet discovered for the snow-bound states.

There are three principal varieties or strains grown here in the United States—Grimm, Baltic and Cossack. The Grimm is by far the most widely grown of the three and its seed can generally be purchased at the lowest cost. ¶



Fig. 46. Cultivated rows of Grimm alfalfa grown in Nebraska for seed.

These are called variegated alfalfas because, instead of having all their blossoms purple, a considerable percentage of them have a variety of colors ranging all the way from white, light yellow and green to smoky hues of purple, brown and blue. They are hybrid alfalfas and have resulted from a natural cross between the common purple-flowered variety and the hardy but poor-producing yellow-flowered alfalfa which the scientists call *Medicago falcata*. Because of its rather poor yields and low spreading habit, yellow-flowered alfalfa is not and will probably never be of any commercial importance in the East or Middle West.

Grimm, Baltic and Cossack—All Good

The three variegated varieties, Grimm, Baltic and Cossack, are all good, and there is no data to show that for the humid areas one is better than another. For success they must be seeded with the same care and cultivated in the same way as the common strains.

Where Grimm Alfalfa Started

According to the records, Grimm alfalfa was introduced into Carver County, Minnesota, in 1857, by Wendelin Grimm, an immigrant from Baden, Germany. He brought with him fifteen or twenty pounds of alfalfa seed, and sowed it in the spring of 1858. Just how well this first seeding of the "ewiger Klee"—everlasting clover—as he called it, succeeded is not definitely known, but at

least enough of the plants survived to furnish seed for future sowings, and in 1867, 480 pounds were threshed from three acres and sold in Minneapolis.

In after years it seems that Mr. Grimm's neighbors attempted to grow alfalfa with common seed produced in other states, but in nearly every case the stands winterkilled, while the fields of Grimm were not injured. The attention of the Minnesota station was



Fig. 47. Threshing Grimm alfalfa seed in Montana.

called to this alfalfa in 1901, and by careful experimentation Grimm alfalfa was found to be far superior to common kinds to withstand unfavorable winters. Since then its growth has been widely extended in the alfalfa-seed-producing states of the West, but even now the Grimm seed is high priced and it is rather hard to get the genuine article.

Origin of Baltic and Cossack

The Baltic alfalfa originated near the little town of Baltic, South Dakota, and is very similar to the Grimm.

The much-advertised Cossack alfalfa was procured in 1907 by the United States Department of Agriculture from Russia. It has a more widely variegated flower than Grimm, but there is no evidence that it is superior in yields or hardiness in the humid states to Grimm or Baltic.

Alfalfas That Do and Don't Winterkill

Why Variegated Alfalfas are Hardy

WHAT makes variegated alfalfa hardier than common alfalfa? Is it the widely spreading crown or the more widely branched roots? Or is hardiness, just an inherited characteristic coming from the rugged paternal yellow-flowered variety?

Probably all three have something to do with it. Variegated alfalfa has both branched and straight tap rooted plants. But the percentage of branched-rooted plants is considerably higher than in the common alfalfa. This may make it more resistant to the heaving effect of freezing and thawing weather.

The crown of the variegated alfalfa is large, decidedly low-set, widely branched and spreading. It may be partly or completely submerged in the soil. Common alfalfa, on the other hand, has a smaller, erect crown, generally high-set above the ground, and more exposed to the injury of alternate freezing and thawing.

Fall Dormancy

A most interesting characteristic of variegated alfalfa is that it prepares itself for the siege of winter. After the third cutting its development is rather sluggish. It may grow six or eight inches by the middle of October, when common alfalfa will be a foot or more in height. It then begins to turn brown, becomes dormant and stops growing, regardless of abundant rains and mild fall weather. It goes to bed early.

Alfalfa that Hibernates

It hardens itself for the severity of the oncoming cold. It is like a burrowing animal. It begins to hibernate early in the fall, and gets itself in that protective dormant condition in which it can stand freezing without being frozen to death.

The common alfalfa keeps right on producing a succulent growth until a sudden freeze puts an abrupt end to its fall activity. This sudden change, I believe, is one of the reasons for the greater sensitiveness of common alfalfa to winter injury. (See Fig. 38.)

An Early-to-bed and Early-to-rise Alfalfa

The variegated strains are the early-to-bed-and-early-to-rise alfalfas. They are the first to slumber in the fall and the first to hearken to the awakening call of spring's gentle breezes. I have seen many instances where the variegated has made from four to six inches of growth in the early spring while adjacent plots of the common were just getting well started. (See Figs. 48 and 51.)

I do not wish to give the impression that variegated alfalfas are better yielders than the common strains, for that is only partly true. Common alfalfa is a most excellent producer, provided it has not

been injured by winterkilling. When variegated alfalfa yields more than the common it is due mainly to its ability to withstand winter injury.

High Priced Seed

The greatest drawbacks to the general growth of variegated alfalfa are the high cost of the seed and the difficulty of getting the genuine article. There is no way of distinguishing the seed of Grimm, Baltic or Cossack from the common seed of the market.

I am informed that so-called Grimm seed has been (1916) retailed at twenty cents a pound. Is it the real Grimm? I don't know. From correspondence with about thirty Western growers of strains of variegated alfalfa seed their quotations will average



Fig. 48. Grimm and Baltic First in Spring Growth.

The dark plots (9) and (11) are the variegated varieties, Grimm and Baltic—two years old. They have not winterkilled and have made a growth of five inches while the adjacent common strains (8), (10) and (12) of the same age have hardly begun to grow.

Photo taken April 1916.

more than double this figure. It is hard for an honest seedsman to compete with the fellow who will buy common seed and sell it as variegated, or who will adulterate his variegated with cheaper seed.

Genuine Seed

Fortunately the growers of Grimm, Baltic and Cossack alfalfa seed are organizing and offering the public certified seed in sealed sacks. Success to them! Many of the adverse reports we hear regarding Grimm alfalfa may be due to use of seed that was not genuine.

For seed production variegated strains are especially profitable. They bring a handsome figure, and the demand will increase rapidly as the price is reduced to a commercial basis. The farmers of the humid states, where there has been trouble from winterkilling and where alfalfa-seed growing is not a success, are willing to pay extra



Fig. 49. Cold Resistant Roots of Grimm Alfalfa.

Grimm alfalfa, like all truly variegated varieties, has a more distinctly branched root system and a more widely spreading crown than the common strains.



Fig. 50. Survival of the Hardest.

The Grimm stood the test. Common Montana alfalfa (to right) winterkilled 78 per cent. Plots seeded at same time and in same way, June 1914, and gave excellent yields in 1915. But the second winter ruined the common Montana strain while the Grimm variety only six feet away came through the very severe winter of 1915-16 without apparent injury and yielded double the amount of weed free hay. Photo taken June 1916.



Fig. 51. Following Hard Winters Grimm Makes Rapid Growth.

Plots sown, June 1914.

Photo taken April 1916.

Note vigorous early spring growth of Grimm in comparison with the two common strains on either side which were so weakened and badly winterkilled by the open winter of 1915-16 that they have scarcely begun to grow.

for variegated seed when they are assured that it is genuine; but with the necessarily heavy rates of seeding they will be interested only in a small way in quotations from fifty cents to one dollar a pound. If they could grow their own seed the initial seed cost would not be a serious matter.

Fortunately, with the rapid extension of the acreage of variegated alfalfa in the West, prices are approaching more nearly a point where the consumer will buy these special varieties in large quantities.

New Seedings of Common Alfalfa are Hardy

In order to avoid disappointing those who may try out variegated alfalfa in comparison with the common the writer wishes to emphasize the fact that there may be little difference in yields and general appearance the first year after seeding. It is only under unusually severe climatic conditions that the variegated will demonstrate its superiority in a one-year trial.

I have sown plots with common Kansas and Nebraska grown alfalfa seed costing thirteen cents a pound, which after a hard winter were equal in every respect to plots of Grimm, Baltic and Cossack, the seed of which cost five times as much. Not so, however, following the second winter. Common alfalfa loses some of its hardiness after it is one year old, and becomes more susceptible to winter injury with increasing age. I don't know why, but it does. Here's an example—one of many that I could give:

June 23, 1915, I seeded a plot of alfalfa with Montana seed in the same manner, under the same soil conditions and with the same strain of seed—taken out of the same bag—as a similar plot not more than three rods distant, which was sown June 27, 1914. Both these plots had excellent stands in the fall of 1915, but in the spring of 1916 seventy-six per cent of the plants in the two-year-old plot had winterkilled, while of the new seeding only nine per cent of winterkilling occurred.

Just why old stands of common alfalfa winterkill more seriously than new seedings is a problem not yet solved, but that it is a fact is further substantiated by 165 reports from members of the Alfalfa Order in 1916, three-quarters of whom declared their old stands winterkilled much more badly than the new seedings of 1915.

Hardiness of Alfalfa and Clover

The significance of this characteristic lies in drawing conclusions from comparative tests with different kinds of alfalfa and clover. It is claimed by some that alfalfa is more subject to winterkilling than is red clover. If you compare new seedings of red clover with old seedings of common alfalfa you may find it so. But if you compare new seedings of clover with new seedings of alfalfa growing under equally favorable conditions the alfalfa will be the hardier of the two. Variegated alfalfa is always hardier.

To make a fair comparison of common and variegated alfalfa the test should be conducted for two or more years. If the second winter happens to be favorable there may not be a great difference until the third year. It takes a severe winter to put the two kinds to the test, and we can judge fairly of their merits only when they have weathered at least two winters.

Common Alfalfa for Rotations

Farmers of the Eastern and Middle-Western States who are growing alfalfa in short three or four year rotations, as they do red clover, will generally find common alfalfa hardy enough to produce good yields for one or two years. But most farmers want alfalfa for a permanent hay crop. They want fields that will last eight or ten years. If common alfalfa fills this requirement let well enough alone.

In the Eastern States much of the alfalfa seed offered on the market has been imported from Russian Turkestan. We speak of it as imported or Turkestan alfalfa. This seed is often infested with buckhorn. Then the fact that it generally has a short fall growth and tendency to produce only two good crops—if three, the third is rather light—has brought it into disrepute. (See Fig. 38.)

Turkestan Hardy

I have tried out some imported Turkestan seed and have found it hardy, lasting longer than common alfalfa and always having a decided tendency to go into a protective state of dormancy early in



Fig. 52. White Seeds in Turkestan.

Imported Turkestan alfalfa seed either has a dull grayish color or if polished the surface feels much rougher than American grown seed. It can also be identified by the distinct presence of ivory white seeds of Russian Knapweed which are generally considered harmless. They are seldom found in seed from any other source.

the fall. But, due to the superiority of the variegated alfalfas and the uncertainty of origin, the Turkestan alfalfa seed or seed imported from any other source has not been encouraged or endorsed.

Fortunately commercial Turkestan alfalfa seed can be identified in most cases by its lighter grayish color or rough surface and the almost always present ivory-white seeds of Russian knapweed, which are seldom if ever found in alfalfa seed from any other source.

Transplanting Alfalfa

SOME alfalfa enthusiasts have laid considerable emphasis on transplanting. The plan is briefly as follows:

Sow alfalfa in the spring in rows three feet apart. Cultivate several times to keep down weeds. Dig up rows of plants in fall. Cut back central roots to six inch length and transplant individual plants in checks 3 feet by 3 feet. The following year cultivate several times to keep out weeds and blue-grass. (See Fig. 39.)

Is this a practical method of growing alfalfa on our fertile farms here in Wisconsin? Have we time and can we afford to grow a hay crop like we would cabbage or strawberries? That transplanting under average conditions is a laborious, costly and impractical method of growing alfalfa is a statement not necessary to make to those who are farming for dollars and cents. In parts of the arid West transplanting has proven quite successful for seed production with hardy varieties. In Wisconsin there may be special soil conditions, such as the sandy soils where this transplanting method might be of some value, but this matter is entirely in the experimental stage and as yet no one has demonstrated its practicability.

Cossack vs. Grimm

Cossack alfalfa plants and seed have, in some sections, been widely if not wildly advertised and sold at fabulous prices for transplanting.

We have had the Cossack alfalfa under trial now for three years. It is a variegated strain like the Grimm and Baltic. We have found it an excellent variety but so far in no way superior in hardiness and yields to the Grimm or Baltic. A neighboring experiment station has tested out the Cossack and arrived at this same conclusion. We hope that future tests may show it to be even better than the Grimm or Baltic.

With all its excellent qualities we would not see fit to generally recommend Cossack alfalfa in Wisconsin if the seed were to cost \$2.00 a pound. For the most part alfalfa seed production in Wisconsin has not been a commercial success due primarily to our abundant rainfall which favors stem and leaf growth far more than seed setting. If it were the initial cost of the seed it would not be a serious matter because we could raise our own supply and sell the surplus at a fancy figure, such as we were required to pay. With our humid conditions we are for the most part dependent upon the more arid West for our supply of seed. For this reason we have been very cautious in the past not to recommend any variety of alfalfa until we were assured our farmers could secure genuine seed at fairly reasonable prices. We believe Grimm will continue to become lower in price as time goes on and as the production out West increases. Cossack alfalfa seed is quite scarce, but it too, will become cheaper as the production increases.

Plant Comparison Not Always Reliable

Some very unfair comparisons and statements have been made regarding the Grimm variety. I have on my desk an illustration showing a row of ten rather small two year old plants of Grimm alfalfa. Below these is shown thirteen immense Cossack plants said to be of the same age. I was told that the ten plants of Grimm in the illustration were taken from a field which had been broadcasted at the rate of 15 pounds of seed an acre and where there were from five to fifteen plants for every square foot of soil. According to information received the large Cossack plants which were said to be of the same age as the Grimm were transplanted in checks about two and a half feet apart each way and cultivated, thus providing from six to eight square feet of cultivated soil for each plant of the Cossack! No wonder they grew big! Is it fair to compare the size of Grimm alfalfa plants from a thickly seeded field with transplanted Cossack plants, having six or more square feet of free soil for the use of each plant to spread out and develop?



Fig. 53. Are Plants 5 and 6 of a Superior Variety?

No. All plants in this illustration are of the same variety, same age, and come from the same Kansas grown seed. Why the difference? Plants 1, 2, 3 and 4 are three years old and were taken from a field of thick alfalfa which had been broadcasted at the rate of 20 lbs. of seed an acre. Plants 5 and 6 were taken from this same field when one year old and transplanted in checks 3 x 3 feet. Their increased size has resulted from cultivation and free available space for development. The branched growth of roots always occurs when alfalfa of any variety is transplanted and the main root is cut back. Sometimes comparisons like this are unfairly used to show the superiority of one variety over another.

Transplanting Develops Widely Branching Roots

Transplant Grimm alfalfa and force it along like a garden vegetable in the same way as those Cossack plants were grown and it will produce these very immense crowns and roots. Even common ordinary alfalfa will grow big sturdy plants if transplanted, culti-

vated and developed under this costly and laborious "tobacco method" of growing alfalfa. We frequently hear of tap and branch rooted varieties of alfalfa. The Grimm, Baltic and Cossack are more distinctly branch rooted than the common. But every alfalfa becomes branch rooted with transplanting. The central roots fail to grow in length after they are cut back and hence they immediately develop an extensive lateral or side root growth. This is true not only of Cossack but of the Grimm and common as well. (See Fig. 53.)

Big Plants do not Mean Big Yields

Many have been given a small packet of Cossack alfalfa seed with instructions to seed in rows and then transplant (3x3 ft.) in the garden. These plants are given garden care. They grow to be of tremendous size and the conclusion naturally follows that this Cossack is a very unusual alfalfa. But we forget that the Grimm or Baltic transplanted in the same way will produce equally surprising results as far as big plants with immense branched roots and crowns are concerned. The only way two or more varieties of alfalfa can be rightly compared is to seed them under identically the same conditions. (See Fig. 53.)

The Cossack alfalfa is a good variety. It's a highly desirable alfalfa from the standpoint of yields and hardiness. Its widely variegated flower may become a characteristic of commercial importance as time goes on. We are not in any sense opposed to Cossack alfalfa as a variety. In fact we have great faith in it—but there are other good alfalfas as well.

Transplanting Fails in Test

While we have had only limited experience with transplanting alfalfa the results of our tests have been more disappointing than we ever anticipated. Four years ago (1913) we transplanted three small plots of fertile clay loam soil with variegated and yellow blossomed alfalfas to observe seed production. Every plant failed to produce seed in any appreciable quantity. In spite of frequent hoeing and cultivation blue-grass took possession of the plots the second year and a year ago we plowed them up.

In September, 1916, we transplanted a twentieth acre plot of rich loam soil with Baltic, Cossack and common purple-flowered Montana alfalfa to test out hay production. The plants were put in checks 3x3 feet. Last spring and during the summer they were cultivated six times but the weeds were abundant in the fall in spite of our determined efforts. Adjacent broadcasted plots seeded in 1915 were practically weed free without any cultivation. In two cuttings the three broadcasted plots with plants from the same seed and of the same age as the transplanted area yielded an average of 9400 pounds of cured hay an acre. The transplanted plots averaged for two cuttings only 600 pounds of cured hay an acre. We are hoping for better results in the future. (See Fig. 39.)

In the seed growing sections of the West transplanting seems to have been used very effectually in disseminating new and hardy varieties of alfalfa where seed was available only in limited amounts. One pound of seed will produce enough plants for about an acre of transplanted alfalfa. In other words, transplanting is a means of

rapidly increasing the seed supply of new varieties by making a "little seed go a long ways." But in the humid areas of the East and Middle West, seed production is not a practical or general success.

High Priced Seed.

Here, alfalfa seed, at such excessive prices of from one to two dollars a pound has been advertised and sold for transplanting on the basis of one acre only requiring about one pound of seed. If transplanting were successful for hay production or seed production in the humid states the price of the seed would not be of serious consequence, but in the light of our experience in Wisconsin it appears to us that transplanting has been primarily advocated by some as a means of selling special varieties of alfalfa at fabulous sums.

When to Cut Alfalfa

THE first crop of alfalfa should be cut when the field is in the advanced bud or has just begun to bloom. Of course, we cannot give any set date for this cutting but it will come about the last of May or the first of June, depending much on the season. Just at the time the flower buds have formed at the top of the plant and perhaps a few of them have already blossomed, it is well to examine the crowns of plants in several places throughout the field. (Fig. 6.)

Watch for the New Sprouts

Here at the base of the stems will be found the little shoots or sprouts which produce the second growth and crop. They may be very small and you may not find many. It is best then to wait for a few days before cutting until you can observe a considerable number of these tiny little leaves and stems sprouting from the base of the alfalfa plants. When they have reached an average length of from one quarter to three quarters of an inch—the cutting stage is at hand. The experienced alfalfa grower knows only too well how important it is not to delay the mowing if rain does not interfere.

The small shoots once started grow very rapidly because after the alfalfa begins to blossom much of its strength is utilized in development of the second growth. If it becomes two to three inches or more in length the sickle will cut the tops off and these small stalks will be checked in their growth. New shoots will then slowly develop from the crowns and the second crop of alfalfa will be delayed from two to three weeks in its growth and harvest. Furthermore, if the soil is infested with blue-grass, or foxtail, or other plant enemies of alfalfa, they may soon take possession of the field and seriously crowd the alfalfa while it is slowly recovering from the effects of having the first and the beginning of the second crop cut at the same time. This is what happens if alfalfa is cut when in full bloom. Furthermore, the delay not only applies to the second crop but the third crop as well, which should never be cut later than the second week in September in the northern states. However, if the third crop is not ready until the middle or latter part of Septem-

ber it is so often cut regardless of this late date as it seems such a waste to allow a good rich growth of alfalfa hay to remain unharvested.



Fig. 54. Late Cutting Delays Succeeding Growth.

Tall alfalfa (on left) shows excellent growth following cutting at right stage. Short alfalfa (on right) shows delayed growth due to cutting previous crop when passed proper stage.

Late Fall Cutting Dangerous

There are occasional seasons where alfalfa may not winterkill, cutting even as late as the last of September; but these are the exceptions rather than the rule. (See Figs. 14 and 37.)

I know of one instance where a field of 40 acres was entirely winterkilled due to cutting the last of September. Similar cases with smaller fields are only too numerous. It is probably a matter of the alfalfa not attaining sufficient growth prior to the first fall frost to hold the snow and protect the crop. Furthermore, it is undoubtedly true that alfalfa cut late in the fall, even though it may only partially winterkill, does not grow nearly so vigorously the following spring and is more apt to be run out by blue-grass than would be the case if the third crop were not cut at all. In the northern states it is much wiser to leave the last crop stand if it is not ready to harvest prior to September 10th and be content with two crops. The alfalfa will generally be ready to cut, however, early enough in the fall to avoid all dangers of winterkilling if the first and second crops have been cut at the proper stage.

When Alfalfa is Affected With Leaf Spot Cut Early

There is a common disease of alfalfa called leaf spot which we know little about. However, it has some influence on the time and stage of cutting alfalfa. Generally all the lower leaves are most badly affected and become covered with brown spots. They soon turn yellow and drop off. In time the entire plant becomes infected and the field appears yellowish green and sickly. The great loss of leaves results in a lower yield and a poorer quality of hay. This

outbreak is most prevalent about one or two weeks before the first cutting. In serious cases immediate cutting is very advisable as the second crop will come up green and healthy and practically free from the disease. When a plant is thus diseased it seems that its strength and energy are thrown into the little shoots at the crowns which consequently grow much more rapidly. This permits much earlier cutting and also facilitates the harvesting before the hay is

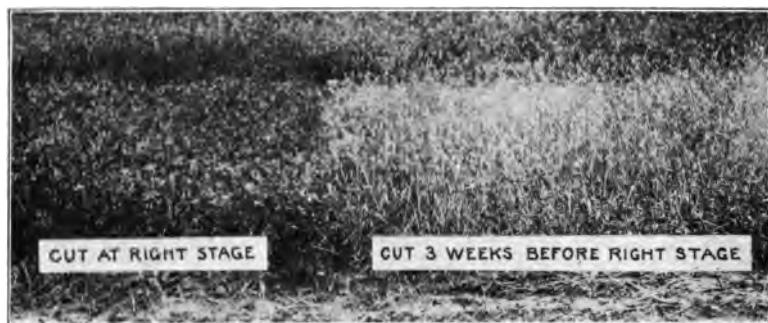


Fig. 55. Cutting Too Early Kills.

Cutting alfalfa too early is bad. The succeeding growth is so severely checked that weeds and grasses spring up and choke out the alfalfa.

seriously damaged by the disease in the way of a loss of leaves. The second growth generally comes entirely free of the disease but it may appear prior to the cutting of the second crop. Only in cases where leaf spot is very serious, and this to be gauged by the development of shoots at the crowns, is extreme early cutting desirable. Generally those alfalfa fields which lack inoculation or need lime are most badly affected with leaf spot.

Dangerous to Cut Alfalfa too Early

Cutting alfalfa before the proper stage sometimes causes such a serious thinning of the stand that weeds and blue-grass soon take possession of the field. While this seldom occurs instances are on record where serious damage has resulted. We have observed it in our experimental work where early and frequent cutting have been tested out. Reports from Woodlawn Farm at Mechanicsburg, Ohio show a decided injury from cutting swaths of alfalfa thru their fields before the proper cutting stage in preparation for a state alfalfa growers' picnic.

Alfalfa Haying and the Weather

How to Cure the Crop in a Rainy Spell

WELL, Sam, you are going to have your hands full to get those ten acres cured and dry with this rainy June weather!"

It was Sam's neighbor speaking. He had never grown a spear of alfalfa in his life, and he was a little bit envious of the fine stand just across the fence.

"Yes," replied Sam, "I'll have my hands full all right, but I am going to have my barns full, too—full of the finest hay in all the world. Worth twice as much for feeding as the timothy I have been growing and you are still growing. I am not worrying about handling alfalfa, but I was worried for a few years about getting it started."



Fig. 56. Hay Caps for Rainy Weather.

They insure valuable alfalfa hay against weather losses.

"Well," interjected the neighbor, "you'll be worried before you get through with it, or I'll miss my guess. This alfalfa business isn't all sunshine and roses. We cut our timothy in July when there's little rain, and it's easy to cure. What are you going to do if it keeps on raining? Your field is ready to cut right now!"

Can't Stop Rain

"Let it rain! Can't stop it! They've been talking about the weather now for centuries, but nothing has ever been done about it. Besides, we need rain to push the corn and wheat along. If I lose this first crop I'll have two more coming anyway. But I don't intend to lose it."

Sam was feeling good-natured in spite of ten rainy days and ten acres of alfalfa anxiously ready to be cut.

Hay Caps

"I just bought four hundred hay caps, forty by forty inches," he went on. "The first clear day I am going to cut the whole business, rake it up the next day and bunch it into cocks of about one hundred pounds each, put on the canvas caps with weights at each corner and let her rain! That's Governor Hoard's way of making alfalfa hay. They say he swears by it, and he has grown alfalfa a good many years.

"Of course, it looks like a lot of work for fellows who are used to doing things in quick fashion with a side delivery and the hay loader. And if it wasn't for this continued rain I wouldn't bother with hay caps. I'd cure it in the windrow and load it up with my drum loader. But with such rains as we have had alfalfa in windrows would have to be handled with a six-tined fork. It would either be silage or manure. So I thought I would try out the caps."

Haying with Napkins

"Well, Sam," replied the neighbor, "if there is one thing that has kept me from growing alfalfa it has been this fancy napkin way of putting up the hay. Somehow I got the idea that the only way it was possible to get alfalfa cured so you could safely put it in the



Fig. 57. Saving Labor.

The bunches are spread out to dry the interior before loading.

barn was to cock it up, put a canvas cap on it, and then after a few days pitch and load the whole business just the way we made hay years ago. For us that's too slow. It may be all right for the fellow with a little patch, but when you have got forty or fifty acres to harvest—why, if we had that much alfalfa we would be haying until Christmas, and then not be through!"

The Hustler's Hay

"I quite agree with you," replied Sam. "You will remember that last year I put up my three crops with the side delivery and

loader, and you wouldn't ask for nicer hay than I had. But I was lucky—didn't get one drop of rain on that hay. With this kind of weather there's little chance of curing alfalfa in the windrow. That's why I'm going to bunch it and use the hay caps and play safe.

"I don't like this way of making hay, either, but I believe it pays when you have weather like this to contend with. It's the only way you can save a crop that's worth twenty dollars and more a ton right now. I intend to take a chance on bad weather with my second and third cuttings and do the job up quick with our side delivery rake and drum loader.

"You're right—this alfalfa proposition is not all sunshine and roses. There are a lot of things a fellow doesn't figure on when he first starts out. It keeps you hustling to get alfalfa started, and it keeps you hustling after you have it started. It's no lazy man's crop. It's the hustler's hay. And a fellow who works as hard as you do ought to grow this very kind of hay. Why don't you try a few acres?"

"Going to," replied the neighbor. "That's why I've been talking to you and getting your views. Good day, Sam."

A Sure Method

I have listened many times to this sort of conversation. Out West the sun shines most of the summer and it is easy to make hay when the sun shines. But if you asked me the way to get the brightest and leafiest green alfalfa hay under the average humid conditions of the Corn Belt and Eastern States I should advise this procedure:

Cut your alfalfa on a day that promises to be fair. Cut it when the little sprouts of the next growth at the crown of the plant have made about an inch of growth. Set the mower bar to leave two inches of stubble so as not to injure these new sprouts or growing points of the next crop. (See Fig. 6.)

Cut at Right Stage

If rain prevents you from cutting at this stage and the sprouts grow two inches or more, then set the bar still higher, so as not to clip them any more than is absolutely necessary. This is very important. Clipping off these fresh growths checks their development so that the following crop will be delayed from ten to twenty days. This means lower yields, and in the Northern States it may result in the total loss of the third crop, since cutting after the first week in September in a section where early frosts occur may not give sufficient time for the eight inches of fall growth necessary for winter protection. But now about the curing.

Do not Dry Alfalfa in Swath

Can we cure alfalfa in the swath as we do timothy? Not if we want to get good hay. At least half the feeding value of the alfalfa plant is in the leaves. With their thin, much-exposed surfaces they dry out quickly, become brittle and break off in handling. The thicker stems cure very slowly, and, if they are stored when too moist, heating in the mow or stack may occur.

Alfalfa should not remain in the swath any longer than necessary

to become well wilted. This may only require four or five hours after cutting in hot, dry weather, or a day if the weather is cool, damp or cloudy. The wilted hay can be raked and bunched without loss of leaves into cocks of about one hundred pounds each. Larger cocks may heat and mold in the center. (See Fig. 36.)



Fig. 58. Rapid Methods for Large Acreages.

With a good hay loader alfalfa can be loaded from the cock or windrow without waste.

Beware of Hay Stored when Damp with Dew or Rain

Under no circumstances should alfalfa hay damp with dew or rain be bunched, raked or stored. Invariably this causes molding, severe heating and possible burning in the mow or stack.

With favorable weather alfalfa will be ready to store two days after bunching. With frequent rains it may require one or even two weeks. I have seen cases where alfalfa round the cocks had grown six inches in height before the hay could be hauled in.

What about the plants under the cocks? Will they be smothered out? Perhaps they will, but not likely. I have left cocks of alfalfa hay on the same places in the field for two weeks straight without injury other than delaying the development of the plants beneath and giving the field an uneven growth and spotted appearance. It is a good plan to move the bunches after five or six days, as this will produce a more uniform growth of the following crop.

How Alfalfa Cures in Bunches

The curing process which goes on when well-wilted alfalfa is bunched is quite remarkable. Neither the leaves nor the stems are dead. The life processes of the plant continue and the moisture moves up the stems through the leaves, resulting in a uniform curing of the hay. In fact the leaves act as pumps in their dying attempts to secure moisture from the stems.

An hour or so before loading the canvas cap is removed and the cocks are spread apart and opened up to wind and sun to free the interior from any surplus moisture. The hay is then ready to be loaded with a drum hay loader, or pitched by hand.

Best Hay but not always Best Method

With this method the brightest green hay is obtained with the least loss of leaves; the hay caps are a security against rain. Is it practicable? Ask a small farmer with ten to twenty acres and

he will swear by it. It is important for him to play sure and to take no weather risks. Large growers who are accustomed to using hay loaders and sweep rakes, side deliveries and the like often scoff at the idea, claiming it impracticable and out of the question with their more extensive farm operations.

What Peter Swartz Says

Peter Swartz, of the Cornalfa Farms, not only enjoys the distinction of being the largest alfalfa grower in Wisconsin, but was recently elected president of the largest and most active alfalfa growers' association in the United States—the Wisconsin Alfalfa Order. He has this to say about curing alfalfa hay by the 'cock-and-cap' method:

"You get the best hay. It is the surest way of curing alfalfa and it is all right for the man with ten to fifteen acres. But it is too slow, costly and laborious for our hundred and ninety acres. We have to use methods that are more rapid and that require less hand labor. We have to use machine labor wherever possible. [Farm labor is scarce and will be scarcer if the war continues." (See Fig. 34.)



Fig. 59. Haying in a Hurry.

For stacking large acreages of alfalfa, sweep rakes may be used.

Side Delivery Rakes for Windrowing

"We rake our wilted hay from the swath into windrows with side-delivery rakes. With two days of fair weather it is generally ready to store, but an hour or so before loading we turn the windrow bottom side up with the side deliveries to allow the hay next to the ground to dry out. Oh, yes, we gamble on the weather, but we make hay while the sun shines to beat the band. If it rains we stir up our windrows by turning them over with the rakes. (See Fig. 35.)

"After the damp hay is thoroughly dry we load it with drum loaders and put it in the mow, or if our barns are full we stack outside, using sweep rakes. It's wonderful how much rain alfalfa will stand and still make good hay. It will stand bad weather far better than timothy or clover. Of course the rain hurts it, but it's surprising how well the cattle do on rained-on, bleached alfalfa hay."

Sweep Rakes

The Cornfalfa Farms are among the few east of the Mississippi that make use of sweep rakes. With them the hay is shoved out of the windrow to the stack, where it is elevated with slings and a two-pole stacker. Haying in this way is very rapid. It is not only



Fig. 60. Sweep Rake in Action.
Shoving the hay from windrow to stack.

pleasant for the operator of a sweep rake, who may ride in a canvas seat back of the team, but the nice green alfalfa hay accumulating in front of the horses gives them an inspiration to go forward!

Green and Brown Cures

When alfalfa is stored in the mow or stack it will maintain its bright green color if it has been thoroughly cured in the cock or windrow under favorable weather conditions. When it is stored a little on the green side, while the stems still contain a considerable amount of the plant juice, heating and fermentation occur in the stack and a very aromatic and palatable brown hay results.

To avoid excessive heating by storing alfalfa when it is a little too green it is well to distribute the hay at the time of storage over several bents in the barn instead of piling it up high in one mow. To avoid misunderstanding I repeat that it is positively dangerous to store any alfalfa hay if it contains moisture from dew or rain, because spontaneous combustion may result, or a charring or molding which will be entirely disastrous to the feeding value of the hay. The interior moisture of the stems and leaves of ordinarily cured hay will not cause this difficulty.

The practicability of the various ways of getting alfalfa hay in condition for the mow or stack will depend entirely upon the locality, climatic conditions, the ultimate use and value of the hay. Just what method should be used is largely a matter of business judgment.

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ALFALFA POEM

"What is the crop that always pays,
And will mature in forty days,
Resisting drought, the frost, the heat
Whose roots reach down one hundred feet?"
ALFALFA

"What makes the swine so healthy feel,
And never raise a hungry squeal,
That wholesome food that never fails
To put three curls into their tails?"
ALFALFA

"What makes all other stock look nice,
And bring the highest market price,
What fills the milk pail, feeds the calf,
And makes the old cow almost laugh?"
ALFALFA

(Anon.)



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